

Revision of the *Lindernieae* (*Scrophulariaceae*) in Madagascar.

1. The genera *Lindernia* All. and *Crepidorhopalon* E. Fischer

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Summary : A revision of the Malagasy species of *Lindernia* and *Crepidorhopalon* is presented. 3 new species of *Lindernia*, *L. horombensis*, *L. bryoides* and *L. natans* are described, 3 new combinations are made and 2 new names in *Lindernia* are proposed. A new combination in *Crepidorhopalon* is made. The phytogeography is briefly discussed.

Résumé : Une révision des espèces malgaches des genres *Lindernia* et *Crepidorhopalon* est présentée. Trois espèces nouvelles de *Lindernia*, *L. horombensis*, *L. bryoides* et *L. natans* sont décrites, trois combinaisons nouvelles et deux noms nouveaux pour *Lindernia* ainsi qu'une combinaison nouvelle pour *Crepidorhopalon* sont proposées. La phytogéographie des espèces est brièvement discutée.

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The *Scrophulariaceae* of Madagascar have mainly been studied by BONATI (1924a,b, 1926, 1927) and PERRIER DE LA BÂTHIE (1931). In spite of their diversity and high phytogeographic significance, no recent comprehensive study is available. For several interesting genera like *Hydrotriche* (RAYNAL, 1979) and *Leucosalpa* (HUMBERT, 1943) more recent monographic work has been done, but a critical revision of the family is still lacking.

Out of 38 genera of Malagasy *Scrophulariaceae*, 9 are endemic (*Hydrotriche*, *Leucosalpa*, *Radamaea*, *Ranopisoa*, *Raphispermum*, *Tetraspidium* and 3 undescribed genera), one genus, *Bryodes* is common to Madagascar and the Mascarenes, 8 genera are introduced (*Angelonia*, *Maurandya*, *Maurandella*, *Mazus*, *Misopates*, *Otacanthus*, *Russelia*, *Veronica*) and 18 genera are also distributed in continental Africa. On species level, 37 out of 78 species (including the introduced species) are endemic, i.e. 47% of all Malagasy *Scrophulariaceae* are restricted to Madagascar.

While preparing the treatment of *Scrophulariaceae* for the "Flore de Madagascar et des Comores", I started with revisions of some critical groups, the most difficult being the tribe *Lindernieae*, subfamily *Gratioloideae*, which is dealt with in this paper.

The first systematic account of the group by BENTHAM (1846) noted *Vandellia diffusa* (L.) Benth. (= *Lindernia diffusa*), *V. scabra* Benth. (= *L. pusilla*), *Ilysantes rotundifolia* (L.) Benth. (= *L. rotundifolia*) and *Torenia stolonifera* Bojer ex Benth. for Madagascar. For all species except *Lindernia pusilla* specimens could be investigated, the latter has to be regarded as doubtful record. BAKER added *Vandellia corymbosa* and *Ilysantes oblongifolia* in 1882.

The first study of Madagascan *Lindernia* was made by BONATI (1924a, 1926), who determined the plants collected by D'ALLEIZETTE, DECARY, HUMBERT, PERRIER DE LA BÂTHIE, VIGUIER and WATERLOT. He described a lot of taxa but some of his systematic and morphological statements seem to be questionable. In 1924a he named *Lindernia humilis* and *L. microcarpaeoides*, both valid species. Three further new species were described by him under the generic name *Craterostigma* (*C. cerastioides*, *C. pygmaea*, *C. perrieri*). Close investigation showed however, that they are related to the African *Lindernia welwitschii* (Engl.) E. Fischer and *L. yaundensis* (S. Moore) E. Fischer. While the African species have abaxial (anterior) staminodes, the Malagasy taxa show abaxial fertile stamens. The recently discovered *Lindernia horombensis*, sp. nov. holds an intermediate position with abaxial stamens showing sterile reduced anthers and short filaments, thus linking both groups.

In the same paper BONATI published *Bryodes perrieri*, which is only a cleistogamous form of *Lindernia nummulariifolia*. Two years later BONATI (1926) described 10 new species of *Ilysantes*, several of them today regarded as valid endemic species. His classification is unfortunately based mainly on staminode characters and the stigma. While the shape of staminodes is much more variable than presumed by BONATI, his figures do not always correspond to the investigated type material. In his descriptions of stigma-characters, a "poculiform" type occurs which I could not observe. One of the tribal characters of the *Lindernieae* is the typical bilobed stigma and BONATI may have mistaken very large stigmas with broad and short lobes for being cupshaped.

According to the generic concept currently accepted (PENNELL, 1935 ; PHILCOX, 1968 ; FISCHER, 1992), the genera *Lindernia* and *Ilysantes* have to be united, because the only separating character, the occurrence of staminodes in *Ilysantes*, is of little systematic value.

The genus *Craterostigma* (FISCHER, 1992) comprising 9 species is confined to continental Africa and Arabia with one species extending to India. It is characterized by its habit (basal leaf rosette, truncate synflorescence), the bothrospermous seeds and the yellow or red root pigment. Subsequently, all Malagasy species described in the genus have to be transferred to *Lindernia*.

The recently described genus *Crepidorhopalon* (FISCHER, 1989, 1992) comprises species with aulacospermous seeds and clubshaped hairs with a multicellular socle, comparable to the hairs of *Urtica*, on the lower lip. One species, *Lindernia microcarpaeoides* belongs here and this extends the range of *Crepidorhopalon* to Madagascar.

Torenia, which will be dealt with in a second paper, is characterized by the very asymmetric ovary with outer and inner hairs and the ± poricidous dehiscence of capsule, which is followed by a dehiscence of calyx (FISCHER, 1992).

KEY TO THE GENERA OF *Lindernieae* IN MADAGASCAR

1. Abaxial (anterior) stamens perfect or reduced to staminodes bearing vestiges of anthers, seed surface with round hollows or long furrows, endosperm starshaped in transverse section (alveolated endosperm).

2. Seed surface with long furrows (aulacospermous), lower lip of corolla with yellow clubshaped hairs on a multicellular socle, very small plants (in Madagascar) 2. *Crepidorhopalon*
- 2'. Seed surface with round hollows (bothrospermous), lower lip of corolla without yellow clubshaped hairs, hairs on the lower lip unicellular, sometimes clubshaped but lacking a socle.
 3. Calyx unwinged (in Madagascar), dehiscence of capsule septicidous, pistil glabrous, abaxial (anterior) stamens perfect or reduced to staminodes, which bear vestiges of anthers.
..... 1. *Lindernia*
 - 3'. Calyx lobes with large wings, dehiscence of capsule ± poricidous, opening at both sides of the septum on the valves, pistil at the apex and in the interior of loculament with hairs, abaxial (anterior) stamens always perfect 3. *Torenia*
- 1'. Abaxial (anterior) stamens always reduced to staminodes, never bearing vestiges of anthers (in Malagasy species), seed surface smooth or only slightly furrowed, endosperm ± polygonal or undulate in transverse section (without alveolated endosperm) 1. *Lindernia*

LINDERNIA All.

Melanges Philos. Math. Soc. Roy. Turin 3, fig. 5 (1766).

- *Vandellia* L., Mant. Pl. 1 : 12 (1767).
- *Bonnaya* LINK & OTTO, Icon. Pl. Select. : 25, tab. 11 (1820).
- *Ilysanthes* RAF., Ann. Nat. : 13 (1820).
- *Tittmannia* RCHB., Icon. Bot. Exot. 1 : 27, tab. 38 (1824).
- *Bryodes* BENTH., in DC., Prodr. 10 : 433 (1846), p.p.

TYPE : *Lindernia procumbens* (Krock.) Philcox (= *L. pygidaria* L.).

KEY TO THE SPECIES OF *Lindernia* IN MADAGASCAR

1. The anterior (abaxial) pair of stamens with fertile anthers or at least with small, reduced vestiges of anthers, filaments curved, geniculate.
 2. Leaves ovate to lanceolate with palmate nerves, which are generally inconspicuous, plants with basal leaf rosette, strictly rupicolous species.
 3. Abaxial stamens with perfect anthers and long filaments, corolla up to 15 mm long, deeply blue to violet, plants glabrous, up to 8.5 cm 8. *L. andringitraise*
 - 3'. Abaxial stamens with small, reduced and sterile anthers, filaments short, corolla up to 7 mm long, whitish to pink, plants shortly pilose, up to 4.5 cm.
 4. Leaves obtuse, 6-7 × 1.5-2 mm, margin entire, capsule as long as enlarged calyx, up to 5.5 mm 9. *L. horombensis*
 - 4'. Leaves acuminate, 10 × 3.5 mm, margin sparsely dentate, capsule much longer than calyx, up to 9-10 mm 7. *L. pygmaea*
 - 2'. Leaves large ovate to lanceolate, nerves pinnate, clearly visible, plants never with basal leaf rosette, generally in moist habitats, only one species (*L. nummulariifolia*) rupicolous.
 5. Leaves generally with long petioles, capsule as long as the calyx or only slightly longer, calyx with long tube and only minute teeth 1. *L. crustacea*
 - 5'. Leaves sessile or only with short petiole, capsule distinctly longer than calyx (except *L. humilis*), calyx at least divided to half of its length.

6. Calyx divided to not more than half of its length.
7. Plants with erect stem, chasmogamous flowers generally with long pedicels, corolla blue to violet, cleistogamous flowers sessile, leaves acuminate, rupicolous species 2. *L. nummulariifolia*
- 7'. Plants decumbent, only with chasmogamous flowers, corolla white to pink, leaves obtuse 3. *L. diffusa*
- 6'. Calyx divided to the base or at least more than half of its length.
8. Fruit globose, as long as the calyx or only slightly longer 4. *L. humilis*
- 8'. Fruit cylindric, attenuate-acuminate, twice as long as the calyx. 6. *L. anagallis*
- 1'. The anterior (abaxial) pair of stamens reduced to clavate or falcate staminodes, only the posterior (adaxial) pair with anthers.
9. Leaves with pinnate nerves, margin distinctly serrate or dentate 5. *L. antipoda*
- 9'. Leaves with palmate nerves, margin entire or only sparsely dentate or crenate.
10. Waterplants, leaves spatulate, obtuse, the upper third largest, floating on water surface, well developed only in the apical part of stem 16. *L. natans*
- 10'. Terrestrial plants of humid places, leaves ovate to lanceolate, acuminate or obtuse, most large in their middle part, basal part of stem usually with well developed leaves.
11. Staminodes curved falcate, tiny moss-like plants growing in small cushions, leaves up to 3 mm long, corolla up to 7 mm long 15. *L. bryoides*
- 11'. Staminodes straight clavate, leaves generally longer than 3 mm.
12. Leaves rounded-obtuse, ± orbicular to broad-lanceolate, plants decumbent to ascending.
13. Corolla small, up to 6 mm long, white 11. *L. viguieri*
- 13'. Corolla large, 8-11 mm, white with blue or violet spots 10. *L. rotundifolia*
- 12'. Leaves lanceolate, acuminate, erect plants, rarely ascending.
14. Large plants up to 30 cm, paraclades numerous, corolla up to 12 mm long 14. *L. paludosa*
- 14'. Small plants up to 10(20) cm, paraclades few, corolla up to 6-8 mm long.
15. Calyx and pedicel glabrous or with few short-stalked glandular hairs 13. *L. parviflora*
- 15'. Calyx and pedicel densely covered with long-stalked glandular hairs 12. *L. bonatii*

1. ***Lindernia crustacea* (L.) F. Muell.** — Fig. 11.

Syst. Cens. Austral. Pl. 1 : 97 (1882).

- *Capraria crustacea* L., Mant. 1 : 87 (1767).
- *Torenia crustacea* (L.) CHAM. & SCHLECHT., Linnaea 2 : 570 (1827).
- *Vandellia crustacea* (L.) BENTH., Scroph. Ind. : 35 (1835).
- *Pyxidaria crustacea* (L.) KUNTZE, Rev. Gen. 2 : 464 (1891).

TYPE : 785.3, China (lecto-, LINN).

Annual plant, root system with weakly developed main root, rooting at the nodes, main axis decumbent to ascending. Stem 8 to 15 cm long. Leaves ovate-orbicular, petiolate, lamina 6-15 mm × 4-9 mm, acuminate with serrate margin, nerves pinnate.

Inflorescence lax, frondate, pedicel 8-9 mm, prolonged in fruit to 14 mm. Calyx 4 mm long, tube 3 mm, teeth 1 mm long, glabrous, enlarged in fruit to 9-10 mm. Corolla white with large blue or violet spots, 7-8 mm long, tube 4-5 mm, upper lip bifid, 3 mm, lower lip 3 mm, stamens 4, all fertile, the anterior abaxial pair with geniculate filaments, 3 mm, the posterior adaxial pair 1.5 mm, filaments short, 1 mm, anthers 1 mm. Ovary 1.5 mm, style 5 mm, stigma bilobed.

Capsule globose, 9-10 mm, seeds bothrospermous.

In sandy, humid places, occurring sometimes as weedy species in disturbed places. It is known from all tropical regions including America, Africa, Asia and Australia.

MATERIAL STUDIED : *Humbert 3950 bis*, environs de Tamatave, 1924 (P) ; *Perrier de la Bâthie 8499*, jardin d'essai de l'Ivoloina, VII.1912 (P) ; 17443, environs de Tamatave, XII.1925 (P).

2. *Lindernia nummulariifolia* (D. Don) Wettst. — Fig. 11.

- In ENGL. & PRANTL, Natürl. Pflanzenfam. IV, 3B : 79 (1891).*
— *Vandellia nummulariifolia* D. DON, Prodr. Fl. Nep : 86 (1825).
— *Pyxidaria nummulariifolia* (D. DON) KUNTZE, Rev. Gen. Pl. 2 : 464 (1891).
— *Vandellia sessiliflora* BENTH., Scroph. Ind. : 37 (1835).
— *Lindernia sessiliflora* (BENTH.) WETTST., *in ENGL. & PRANTL, Natürl. Pflanzenfam. IV, 3B : 79 (1891).*
Type : *Wallich 3959*, Burma (holo-, K).
— *Vandellia corymbosa* BAKER, Journ. Bot. 20 : 221 (1882), *syn. nov.* Type : *Baron 236*, centre de Madagascar (lecto-, K).
— *Bryodes perrieri* BONATI, Bull. Soc. Bot. Genève, Sér. II, 15 : 104 (1924), *syn. nov.* Type : *Perrier de la Bâthie 13073*, Lac Intriva, Antsirabe, 1200 m, 4.II.1920 (holo-, P).

TYPE : *Wallich s.n.*, Nepal, Himalaya (holo-, K).

Annual plant, root system with weakly developed main root, main axis erect. Stem 4 to 13 cm long. Leaves ovate-orbicular, 5-10 mm × 5-8 mm, acuminate with dentate margin, nerves pinnate.

Inflorescence lax, frondate, pedicel 4 mm, prolonged in fruit to 10 mm, cleistogamous flowers sessile. Calyx divided to about 2/3 of its length, 2.5 mm, tube 0.8 mm, teeth 1.7 mm, glabrous. Corolla white with large blue or violet spots, 5.5 mm, tube 3 mm, upper lip bifid, 2 mm, lower lip 2.5 mm, stamens 4, all fertile, the anterior abaxial with geniculate filaments, 2.5-3 mm, the posterior adaxial pair 1 mm. Ovary 1.5 mm, style 3 mm, stigma bilobed.

Capsule broad cylindric, 10 mm, seeds bothrospermous.

On rocky outcrops and granitic inselbergs, mostly on shallow, humid soil. The species is known from Africa, India, Nepal, Burma, China, Thailand and Vietnam.

MATERIAL STUDIED : *Baron 236*, centre (K, P) ; 286, *ibid.* (P) ; 577, *ibid.* (K) ; 3278, *ibid.* (P) ; 4052, *ibid.* (K) ; *Bosser 19878*, sud d'Ambalavao, 10.II.1970 (P) ; *Decary 720*, Tananarive (Ankatsao), 23.I.1921 (P) ; *Fischer 29*, Inselberg Lohavohitra at Andranovelona, 25.III.1993 (BONN) ; 130, inselberg N. Ambositra, 28.III.1993 (BONN) ; 163, inselberg at Tsarasaotra S. Ambositra, 29.III.1993 (BONN) ; *Forsyth Major s.n.*, Ambohitombo forest, 25.I.1895 (K) ; *Humbert 20631*, vallée de la Manampanily, aux environs

d'Anpasimena, III.1947 (P) ; *Morat* 3455, route de Ihosy, PK 577, III.1976 (P) ; *Perrier de la Bâthie* 9075, Bemarivo, 1907 (P) ; 13703, Lac Trintriva près Antsirabe, IV.1920 (P) ; 14323, Massif d'Andringitra, 1200 m, I.1922 (P) ; 17916, Tananarive, 1400 m, II.1927 (P) ; *Seyrig* 611, environs d'Ampandrandava, entre Bekily et Tsivory, V.1943 (P).

3. *Lindernia diffusa* (L.) Wettst. — Fig. 11.

In ENGL. & PRANTL, Natürl. Pflanzenfam. IV, 3B : 80 (1891).
— *Vandellia diffusa* L., Mant. 1 : 89 (1767).
— *Pyxidaria diffusa* (L.) KUNTZE, Rev. Gen. Pl. 2 : 464 (1891).

TYPE : *Lyall s.n.*, Madagascar (holo-, K).

Annual plant, rootsystem with weakly developed main root, rooting at the nodes, main axis decumbent to ascending. Stem up to 20 cm long. Leaves ovate-orbicular, shortly petiolate or sessile, 10-25 mm × 8-15 mm, obtuse with crenate margin, nerves pinnate.

Inflorescence lax, frondate, pedicel 3-4 mm. Calyx 6-7 mm, tube 4 mm, teeth 2-3 mm, pubescent. Corolla white with blue or violet spots, 10 mm long, tube 6-7 mm, upper lip emarginate, 3 mm, lower lip 3 mm, stamens 4, all fertile, the anterior abaxial pair with geniculate filaments, 3 mm, the posterior adaxial pair 1 mm. Ovary 1 mm, style 5 mm, stigma bilobed.

Capsule cylindric, attenuate-acuminate, 12 mm, seeds bothrospermous.

A widespread species known from Central and South America and Africa. It is frequently found in disturbed habitats.

MATERIAL STUDIED : *Baron* 1893, centre de Madagascar (K) ; *Decary* 2186, Maromandia (P) ; *Gerrard* 97, s.loc., 21.VI.1866 (K) ; *Hodgkin & Stansfield* 339, Central Plateau (K) ; *Parker s.n.*, Central Madagascar, VIII.1880 (K) ; *Perrier de la Bâthie* 8466, Ihosy (?), Riv. Simiana, 1912 (P) ; *Viguier & Humbert* 155, Tamatave, jardin d'Ivoloina, 20.IX.1912 (P).

4. *Lindernia humilis* Bonati. — Fig. 11.

Bull. Soc. Bot. Genève, Sér. II, 15 : 100 (1924).
— *Lindernia subreniformis* PHILCOX, Bol. Soc. Brot., Sér. 2 : 268 (1987). Type : *Vollesen* 3931, Tanzania, ca. 19 km S.S.-W. Kingupira, 15.VIII.1976 (holo-, K).

TYPE : *Perrier de la Bâthie* 8502, Mangoky, VIII.1911 (holo-, P).

Annual plant, rootsystem with weakly developed main root, rooting at the nodes, main axis decumbent to ascending. Stem 8 to 26 cm long. Leaves ovate-orbicular, sessile, 5-12 mm × 6-12 mm, acuminate with dentate margin, nerves pinnate.

Inflorescence lax, frondate, pedicel 5-6 mm, prolonged in fruit to 10 mm. Calyx deeply divided, 2.5 mm, tube 0.3 mm, teeth 2.2 mm, glandular pubescent. Corolla blue or violet with darker

spots, 4.5 mm long, tube 2.5 mm, upper lip entire, 2 mm, lower lip 2 mm, stamens 4, all fertile, the anterior abaxial pair with geniculate filaments, 2 mm, the posterior adaxial pair 1.2 mm, filaments short, 1 mm, anthers 0.5-1 mm. Ovary 0.8-1 mm, style 2 mm, stigma bilobed.

Capsule globose, 3 × 3 mm, seeds bothrospermous.

Known from the East African coast (Kenya, Tanzania, Mocambique) and Madagascar. The species prefers humid, sandy soil.

MATERIAL STUDIED : *Douillot s.n., s.loc.,* 2.II.1892 (P) ; *Perrier de la Bâthie* 8502, bassin du Mangoky, VIII.1911 (P).

5. *Lindernia antipoda* (L.) Alston. — Fig. 11.

In TRIMEN, Hand-Book Fl. Ceylon VI, suppl. : 214 (1931).

- *Ruellia antipoda* L., Sp. Pl. : 635 (1753).
- *Ilysanthes tenuifolia sensu* BONATI, *non Ilysanthes tenuifolia* (SPRENGEL) URBAN : BONATI, Bull. Soc. Bot. Genève, Sér. II, 18 : 9 (1926) ; H. PERRIER, Cat. Plantes Madagascar : 10 (1931).

TYPE : *Herrmann* 235, Ceylon (lecto-, BM).

Annual plant, root system with weakly developed main root, rooting at the nodes, main axis ascending to erect. Stem 5 to 20 cm long. Leaves lanceolate to obovate-oblong, 10-40 mm × 3-10 mm, acuminate with serrate margin, nerves pinnate.

Inflorescence lax, frondobracteate, pedicel 2-6 mm, prolonged in fruit to 4-15 mm. Calyx deeply divided 4 mm long, glabrous, enlarged in fruit, 5-6 mm. Corolla pale purple, (6)8-10(11) mm long, stamens 4, the anterior abaxial pair reduced to filiform staminodes, 3 mm, the posterior adaxial pair 2 mm, filaments short, 1.5 mm.

Capsule cylindric, attenuate-acuminate, 10-16 × 1-1.3 mm, pedicel reflexed, seeds bothrospermous.

A widespread asiatic species known from Ceylon and India to China, Japan, Malaysia, Australia, New Guinea, Micronesia and Polynesia. It is growing in humid soil near water, in swamps and rice-fields.

MATERIAL STUDIED : *Perrier de la Bâthie* 8442, Bombetoke, V.1908 (P) ; 9058, à Maevarano près Majunga, VIII.1923 (P) ; 17260, Majunga, IV.1925 (P).

6. *Lindernia anagallis* (Burm. f.) Pennell. — Fig. 12.

J. Arnold Arbor. 24 : 252 (1943).

- *Ruellia anagallis* BURM. f., Fl. Ind. : 135 (1768).
- *Vandellia pedunculata* BENTH., Scroph. Ind. : 37 (1835).

- *Lindernia pedunculata* (BENTH.) WETTST., in ENGL. & PRANTL, Nat. Pflanzenfamilien IV. 3B : 79 (1891); BONATI, Bull. Soc. Bot. Genève, Sér. II, 15 : 102 (1924). Type : Wallich 3951A, East Bengal, Sylhet (lecto-, K).
- *Vandellia angustifolia* BENTH., Scroph. Ind. : 37 (1835). Type : Wallich 3951B, Nepal, (lecto-, K).

TYPE : *Kleinhof s.n.*, Java, in 1759 (holo-, L).

Annual plant, root system with weakly developed main root, rooting at the nodes, main axis decumbent to ascending. Stem 20 to 60 cm long. Leaves deltoid-ovate, shortly petiolate or sessile, 5-25 mm × 3-12 mm, obtuse with crenate margin, glabrous, nerves pinnate.

Inflorescence lax, frondate, pedicel 10-50 mm. Calyx deeply divided, 4-5 mm, glabrous. Corolla purple, 10-16 mm, upper lip emarginate, stamens 4, all fertile, the anterior abaxial pair with geniculate filaments, anthers each with connective of lower locule produced into a tail as long as the cell, the posterior adaxial pair 1.5 mm.

Capsule cylindric, attenuate-acuminate, 8-10 × 1.5 mm, seeds bothrospermous.

L. anagallis is known from India, southern China, Thailand, Laos, Vietnam, Malaysia, Australia, the Phillipines and New Guinea. In Madagascar it is found on sandy soil near water.

MATERIAL STUDIED : *Perrier de la Bâthie* 64, rizières-alluvions de l'Ikopa, Ambodiroka, VIII.1896 (P) ; 8480, sables d'Ikopa aux environs de Maevatanana, VII.1900 (P) ; 17318, sur les sables de l'Ikopa près de Maevatanana, VII.1925 (P).

7. *Lindernia pygmaea* (Bonati) E. Fischer, comb. nov. — Fig. 1, 11.

- *Craterostigma pygmaea* BONATI, Bull. Soc. Bot. Genève, Sér. II, 15 : 107 (1924).

TYPE : *Perrier de la Bâthie* 12512, in media Insula, saxeta humida 1200 m alt., Midongy d'Ouest, III.1919 (holo-, P).

Annual pubescent plant, root system with weakly developed main root, main axis erect. Stem 1.2 to 2.3 cm tall. Leaves lanceolate ovate, petiolate, in basal rosette, 8-10 mm × 3.5 mm, obtuse to acuminate with sparsely serrate margin, nerves palmate, inconspicuous.

Inflorescence lax, frondobracteate, pedicel 4-6 mm, prolonged in fruit to 10 mm. Calyx 4.5 mm, tube 1.8-2.3 mm, teeth to 2.2 mm, pubescent, enlarged in fruit to 5.5 mm. Corolla white with large pinkish to violet spots, 6.8-7 mm, tube 4 mm, upper lip bifid, 3 mm, lower lip 3.5 mm, stamens 4, all fertile, the anterior abaxial pair reduced, with geniculate filaments, 1.4 mm, anthers 0.2 mm, extremely reduced, the posterior adaxial pair 1.2 mm, filaments short, 0.6 mm, anthers 1 mm. Ovary 1 mm, style 5-6 mm, stigma bilobed.

Capsule cylindric, acuminate-attenuate, 9-10 mm, seeds bothrospermous.

An endemic species known only from the Andringitra massif, the Horombe Plateau and Ambatolampy where it is growing on peaty soil in *Coleochloa setifera* mats on granitic inselbergs, together with *Xerophyta dasylirioides*, *X. pinifolia* and several succulents (*Euphorbia* sp., *Pachypodium densiflorum*).

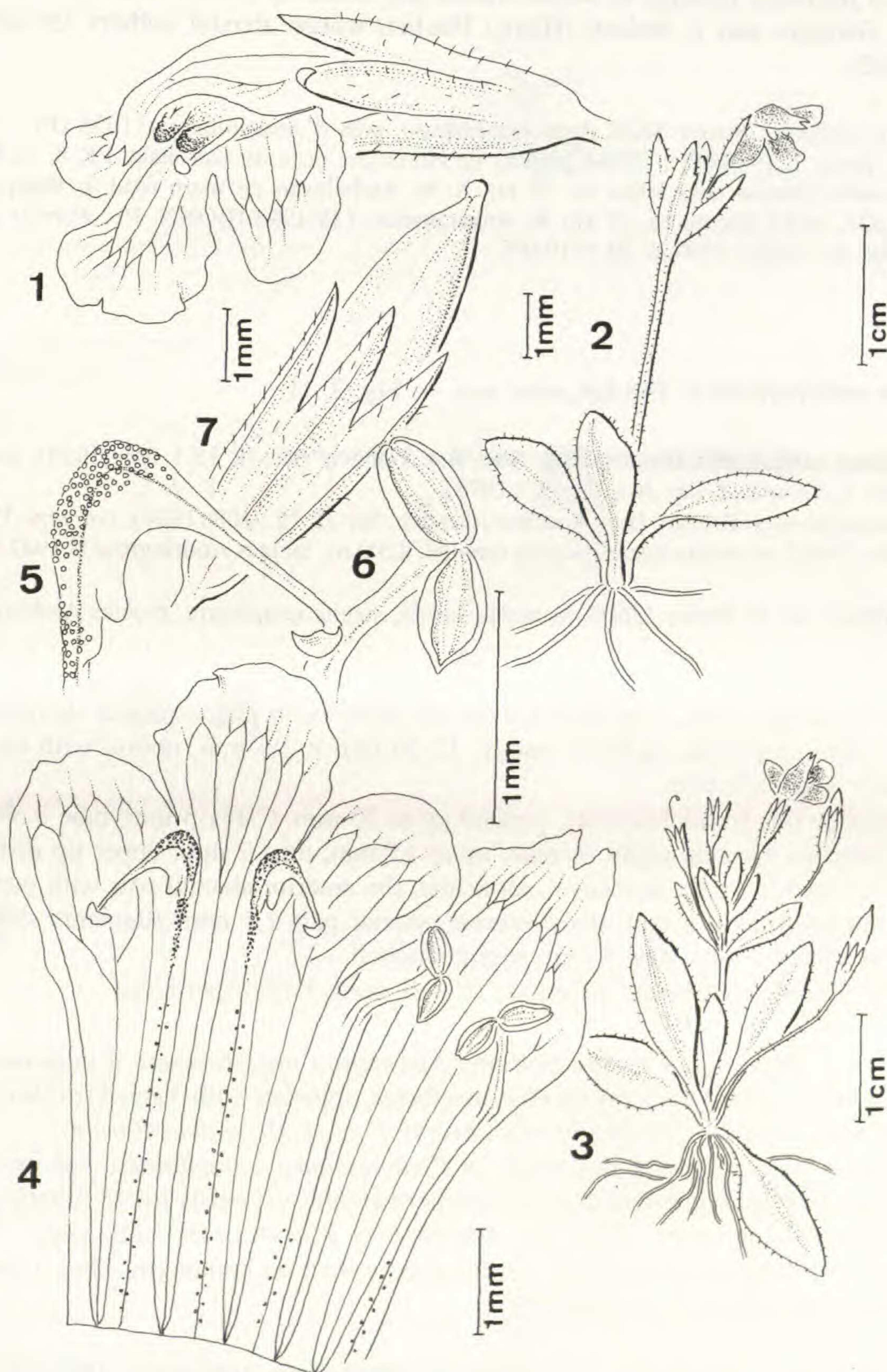


Fig. 1. — *Lindernia pygmaea* (Bonati) E. Fischer : 1, flower ; 2, 3, habit ; 4, corolla dissected ; 5, abaxial stamen ; 6, adaxial stamen ; 7, capsule. 1, 2, 4-7 from Fischer 215 ; 3 from Bosser 8820.

Lindernia pygmaea belongs to Sectio *Nanae* and finds its closest relatives with *Lindernia boutiqueana* Germain and *L. bolusii* (Hiern) Fischer, whose abaxial anthers are also reduced (FISCHER, 1992).

MATERIAL STUDIED : *Bosser* 8820, Ambohimandroso, près d'Ambatolampy, 1955 (P) ; 17878, entre Ambalavao et Ihosy, II.1983 (P) ; 19884, plateau de Horombe, piste de Satrokala, PK 8, 11.II.1970 (P) ; *Fischer* 215, rocky plateau near Isaka ca. 25 km S.-W. Ambalavao on main road to Ihosy, 30.III.1993 (BONN, P) ; 324, rocky plateau ca. 25 km W. Ankaramena, 7.IV.1993 (BONN, P) ; *Perrier de la Bâthie* 12512, Midongy de l'ouest, 2200 m, III.1919 (P).

8. *Lindernia andringitiae* E. Fischer, nom. nov. — Fig. 2, 11.

- *Craterostigma cerastioides* BONATI, Bull. Soc. Bot. Genève, Sér. II, 15 : 106 (1924), *non Lindernia cerastioides* T. YAMAZ., J. Jap. Bot. 53 : 97 (1978).
- *Craterostigma perrieri* BONATI, Bull. Soc. Bot. Genève, Sér. II, 15 : 108 (1924), *syn. nov.* Type : *Perrier de la Bâthie* 14423, in media Insula : saxeta humida, 2200 m, montes Andringitra, II.1922 (holo-, P).

TYPE : *Perrier de la Bâthie* 13600, in media Insula, stagna temporaria, montes Andringitra, II.1921 (holo-, P).

Perennial glabrous plant, 4 cm up to 8.5 cm tall, main axis a plagiotropic shortened rhizome. Leaves lanceolate spathulate, in basal rosette, 12-20 mm × 2-4 mm, obtuse with entire margin, nerves palmate, inconspicuous.

Inflorescence lax, frondobracteate, pedicel up to 20 mm. Calyx 5 mm, tube 3.5-4 mm, teeth 1-1.5 mm, glabrous. Corolla violet or blue, up to 15 mm, tube 7 mm, upper lip distinctly bifid, 3.5 mm, lower lip 6.5-7 mm, stamens 4, all fertile, the anterior abaxial pair with geniculate filaments, 4.5 mm, anthers 0.5 mm, the posterior adaxial pair 1.5 mm, filaments short, 0.5 mm, anthers 1 mm. Ovary 1 mm, style 8 mm, stigma bilobed.

Capsule cylindric, acuminate-attenuate, 10 mm, seeds bothrospermous.

An endemic species known only from the Andringitra massif, where it is growing on peaty soil in *Coleochloa setifera* mats on granitic inselbergs, together with *Xerophyta dasylirioides*, *X. pinifolia* and several succulents (*Euphorbia duranii*, *Pachypodium densiflorum*).

The species was originally described as *Craterostigma cerastioides*, but proved to be a *Lindernia*. However the combination *Lindernia cerastioides* yet exists for an Asiatic species. The use of *Craterostigma perrieri*, which was described by BONATI in the same paper, but is only a synonym of *Craterostigma cerastioides*, would also produce an homonym. Thus it became necessary to create a new name (*L. andringitiae*).

MATERIAL STUDIED : *Guillaumet* 3737, plateau de Andohariana, Andringitra, 2000-2100 m, 12.I.1971 (P) ; *Homolle* 1148, Andringitra (P) ; 1294, s.loc., 1946 (P) ; *Perrier de la Bâthie* 13600, Massif d'Andringitra, 2000 m, IV.1921 (P) ; 14423, *ibid.* (P) ; 14429, *ibid.*, 2200 m (P) ; *Rakotovao* 174, Antandrokaomby, Mahasoa, Distr. Ambalavao, 9.IV.1955 (P).

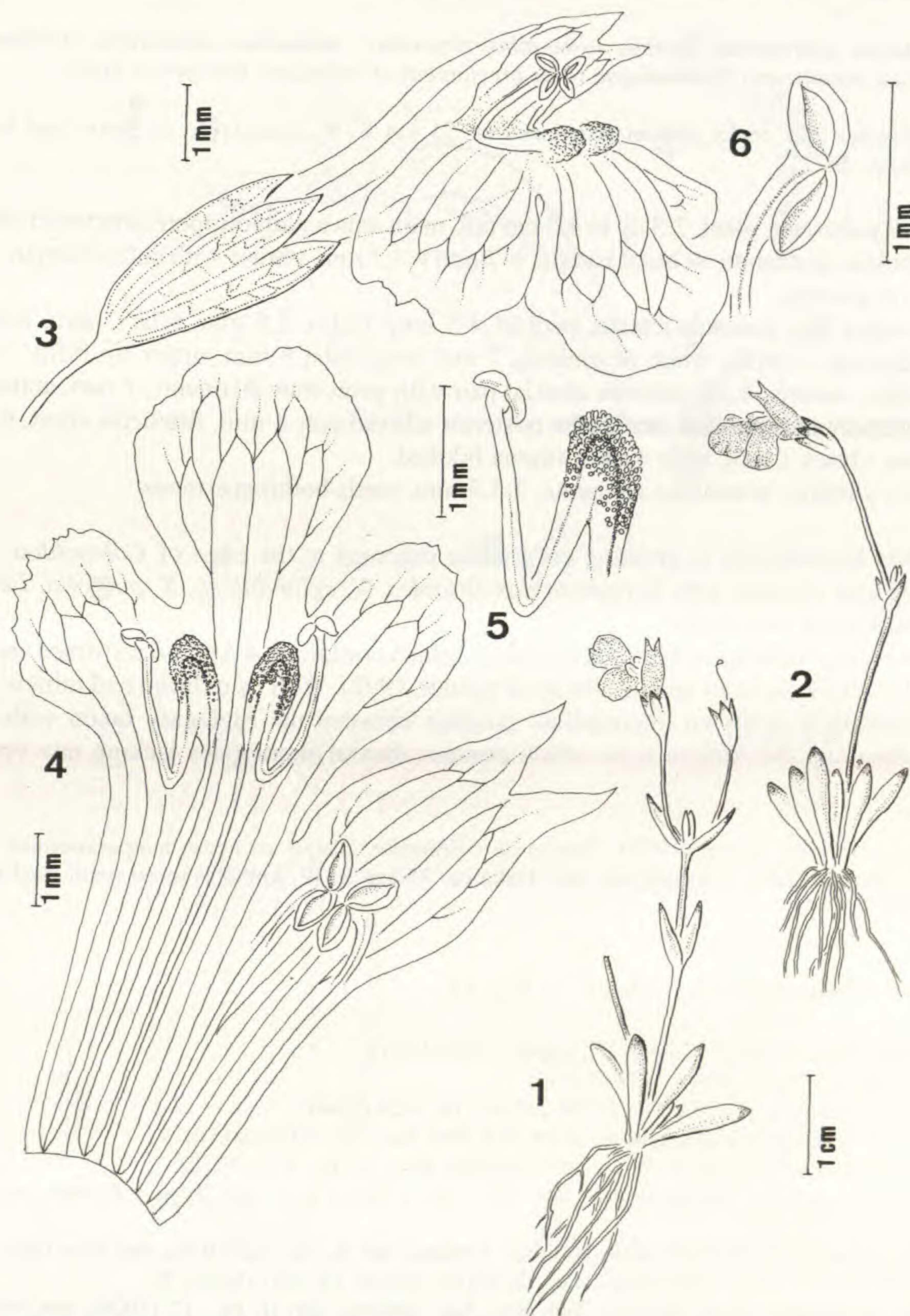


Fig. 2. — *Lindernia andringitiae* E. Fischer : 1, 2, habit ; 3, flower ; 4, corolla dissected ; 5, abaxial stamen ; 6, adaxial stamen. All from Guillaumet 3737.

9. *Lindernia horombensis* E. Fischer, sp. nov. — Fig. 3, 12.

Ab Lindernia andringitrae floribus roseo-albis minoribus, staminibus abaxialibus sterilibus cum antheris reductis minutissimis filamentisque valde brevioribus et indumento brevipiloso differt.

TYPE : *Fischer* 226, rocky plateau near Isaka ca. 25 km S.-W. Ambalavao on main road to Ihosy, 30.III.1993 (holo-, P).

Perennial pubescent plant, 2.5 up to 4.5 cm tall, main axis a plagiotropous shortened rhizome. Leaves lanceolate spathulate, in basal rosette, 6-7 mm × 1.7 mm, obtuse with entire margin, nerves palmate, inconspicuous.

Inflorescence lax, frondobracteate, pedicel 4-5 mm. Calyx 3.5 mm, tube 2 mm, teeth 1.2-1.5 mm, pubescent. Corolla white or pinkish, 7 mm long, tube 3 mm, upper lip bifid, 2.8 mm, lower lip 4 mm, stamens 4, the anterior abaxial pair with geniculate filaments, 1 mm, anthers 0.1-0.2 mm, extremely reduced and sterile, the posterior adaxial pair 1 mm, filaments short, 0.6 mm, anthers 1 mm. Ovary 1 mm, style 4 mm, stigma bilobed.

Capsule cylindric, acuminate-attenuate, 5-5.5 mm, seeds bothrospermous.

Lindernia horombensis is growing on granitic outcrops at the edge of *Coleochloa setifera* mats in peaty soil together with *Xerophyta dasylirioides*, *X. eglandulosa*, *X. pinifolia*, *Lindernia pygmaea* and several succulents.

L. horombensis belongs to Sectio *Scapoideae*, which comprises 4 African restricted endemics, all confined to rocky outcrops and inselbergs (FISCHER, 1992). With its reduced and minute anthers on short filaments it holds an intermediate position between the Malagasy taxon with perfect abaxial stamina and the African taxa, which possess abaxial staminodes lacking any vestige of anthers.

MATERIAL STUDIED : *Bosser* 17684, Plateau de l'Horombe, plaque rocheuse temporairement humide, IX.1963 (P) ; *Fischer* 226, rocky plateau near Isaka ca. 25 km S.-W. Ambalavao on main road to Ihosy, 30.III.1993 (P).

10. *Lindernia rotundifolia* (L.) Alston. — Fig. 13.

In TRIMEN, Hand-Book Fl. Ceylon VI, Suppl. : 214 (1931).

- *Gratiola rotundifolia* L., Mant. : 174 (1771).
- *Ilysanthes rotundifolia* (L.) BENTH., in DC., Prodr. 10 : 420 (1846).
- *Lindernia rotundifolia* (L.) MUKERJEE, Journ. Ind. Bot. Soc. 24 : 132 (1945).
- *Lindernia rotundifolia* (L.) L.O. WILLIAMS, Fieldiana Bot. 34 (8) : 122 (1972).
- *Ilysanthes oblongifolia* BAKER, Journ. Bot. 20 : 221 (1882), syn. nov. Type : *Parker* s.n., Central Madagascar (holo-, K).
- *Ilysanthes hypericifolia* BONATI, Bull. Soc. Bot. Genève, Sér. II, 18 : 10 (1926), syn. nov. Type : *Perrier de la Bâthie* 8476, Ouest : Marécages Haut Bemarivo, Boina, IV.1907 (holo-, P).
- *Ilysanthes madagascariensis* BONATI, Bull. Soc. Bot. Genève, Sér. II, 18 : 12 (1926), syn. nov. Type : *Perrier de la Bâthie* 8468, Centre : Bords du Maningory, lac Alaotra, XII.1912, (holo-, P).

TYPE : *Roxburgh* s.n., India (holo-, K).

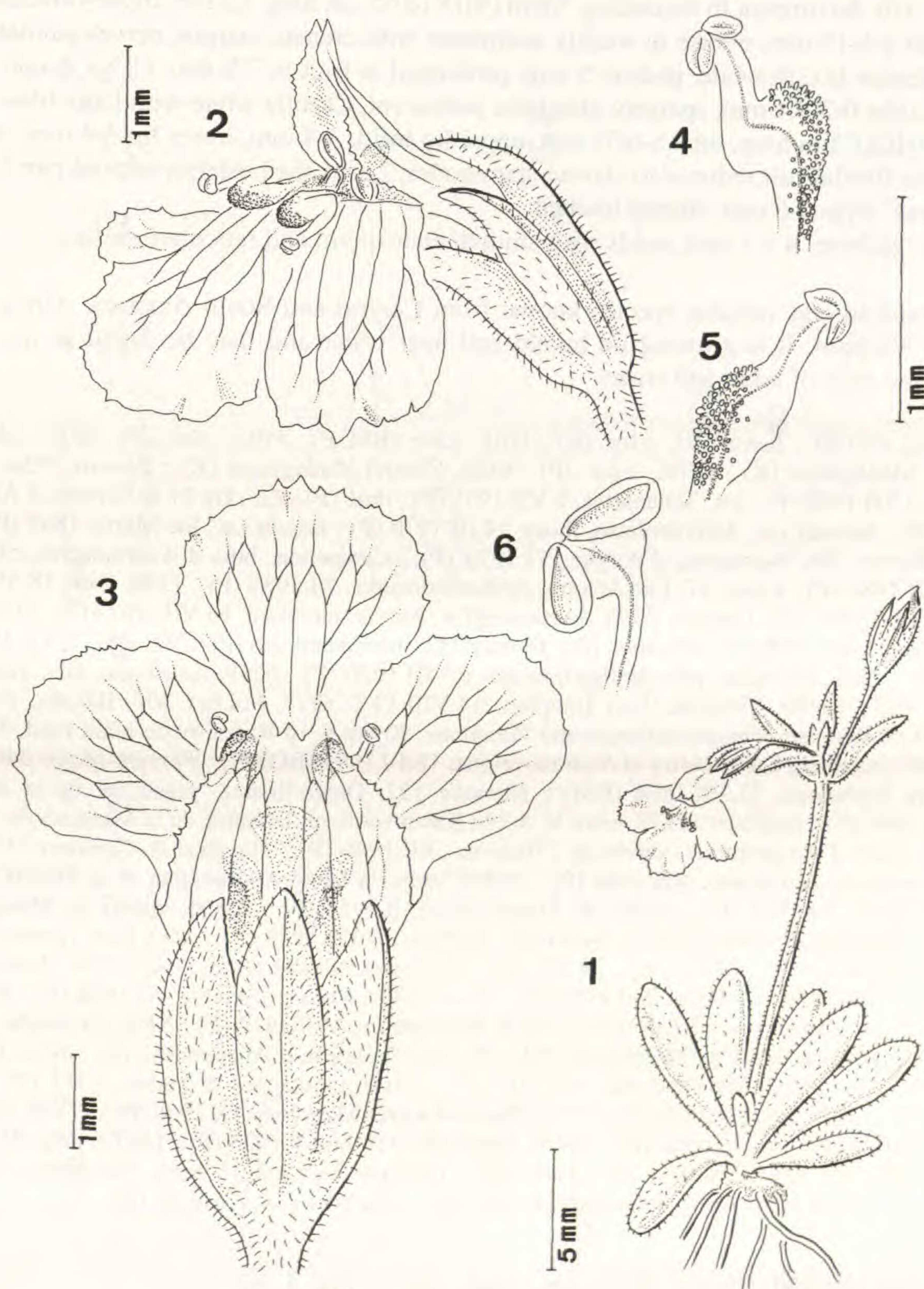


Fig. 3. — *Lindernia horombensis* E. Fischer : 1, habit ; 2, flower ; 3, flower seen from dorsal ; 4, 5, staminode ; 6, stamen. All from Fischer 226.

Perennial plant, rarely annual, rootsystem with weakly developed main root, rooting at the nodes, main axis decumbent to ascending. Stem (9)18 to 65 cm long. Leaves ovate-orbicular, sessile, 7-11 mm × 6-11 mm, obtuse to weakly acuminate with crenate margin, nerves palmate.

Inflorescence lax, frondate, pedicel 5 mm, prolonged in fruit to 7-8 mm. Calyx deeply divided, 4-5 mm, tube 0.2-0.4 mm, sparsely glandular pubescent. Corolla white with large blue or violet spots, (8)10-11 mm long, tube 5-6(7) mm, upper lip bifid, 3-4 mm, lower lip 3-4 mm, stamens 4, the anterior abaxial pair reduced to clavate staminodes, 2 mm, the posterior adaxial pair 1.5 mm. Ovary 1.5 mm, style 5-6 mm, stigma bilobed.

Capsule globose, 4 × 5 mm, seeds with smooth endosperm and reticulate surface.

A widespread and variable species known from Central and South America, Africa, India, Ceylon and Vietnam. It is growing on humid soil near water and may be found in rice-fields, swamps, at the edge of lakes and rivers.

MATERIAL STUDIED : *Baron* 561, s.loc. (K) ; 3161, s.loc. (BM, P) ; 3592, s.loc. (P) ; 4057, s.loc. (K) ; 5330, N.-W. Madagascar (K) ; 6319, s.loc. (P) ; 9161, Central Madagascar (K) ; *Benoist* 393a, Parc de Tsimbazaza, 9.XII.1950 (P) ; s.n., Tananarive, 8.VII.1951 (P) ; *ibid.* (P) ; s.n., km 11 de la route d'Antsirabe, 18.IV.1951 (P) ; *Boiteau* s.n., Anavabohitso, Ihosy, 14.III.1970 (P) ; *Boivin* s.n., Ste Marie, 1849 (P) ; *ibid.*, 1852 (P) ; *Bosser* 366, montagnes d'Ambre, VI.1970 (P) ; *Campenon*, bois d'Andrainarivo, 50 km N. Tananarive, II.1988 (P) ; *Cours* 17, Lac Alaotra, Ambatondrazaka, XI.1937 (P) ; 1286, *ibid.*, IX.1938 (P) ; 2692, s.loc., 27.II.1945 (P) ; *Cremers* 2505, Analamera Est, Anivoramo Nord, 16.VIII.1973 (P) ; *D'Alleizette* 291, Nanisana, 23.XII.1909 (P) ; 929, *ibid.* (P) ; *Decary* 732, Imerimandroso (P) ; 741, *ibid.*, 2.VII.1921 (P) ; 754, *ibid.* (P) ; 4571, Befotaka, près de Farafangana, 6.VIII.1926 (P) ; 6259, Anosivato, env. Tananarive, 22.VII.1928 (P) ; 10309, Vinanibe, Fort Dauphin, 14.VIII.1932 (P) ; *Fischer* 307, Ilakaka, river with gallery forest of *Ravenea madagascariensis* and *Pandanus*, 20 km S. of Ranohira on main road, 5.IV.1993 (BONN) ; 407, inselberg Lohavohitra at Andranovelona, 18.IV.1993 (BONN) ; *Forsyth-Major* 640, Mount Antely above Ambositra, 11.XII.1894 (BM) ; *Homolle* 122, Diégo-Suarez, grand lac de la montagne d'Ambre, X.1944 (P) ; *Humbert* 12123, entre le col du Kalambatitra et la vallée de la Manambolo, XI.1933 (P) ; 19677, Forêt d'Analamarina, vallée de l'Hazoroa, XII.1946 (P) ; *Humbert & Capuron* 21988, env. d'Andapa, bassin de la Lokoho, XII.1948 (P) ; 24833, entre la haute Andramonta et la Mafaika (bassin d'Antanambalana), 3.I.1951 (P) ; 25389, N. Mangindrano, II.1951 (P) ; 25396, marais de Mangindrano, II.1951 (P) ; *Humbert & Swingle* 4593, Antsirabe, 1600 m, 20.VII.1929 (P) ; *Jard. Bot. Tananarive* 164, Tsimbazaza, 12.V.1935 (P) ; 1376, s.loc., 29.XII.1885 (P) ; *Labat, Phillipson & Lowry* 2009, Antananarivo, station forestière de Manjakatompo, 28.I.1990 (P) ; *Morat* 1388, Massif d'Ambre, XI.1964 (P) ; *Perrier de la Bâthie* 8425, Analahitso, VIII.1912 (P) ; 8429, Miarinarivo, VIII.1912 (P) ; 8463, Antsirabe, XI.1912 (P) ; 8468, Lac Alaotra, bords du Maningory, 1912 (P) ; 8475, plateau d'Analamaitsio (P) ; 8476, Bemarivo (Boina), 1912 (P) ; 8482, Maevatanana, VII.1912 (P) ; 8500, montagnes d'Ambre, 1913 (P) ; 10464, Tananarive (P) ; 17651, *ibid.*, X.1926 (P) ; 17753, Betsiboka près Marovoay, IX.1926 (P) ; 17769, montagnes d'Ambre, IX.1926 (P) ; 17793, *ibid.* (P) ; 18478, Antsirabe, 1500 m, V.1928 (P) ; 18479, *ibid.* (P) ; 18875, s.loc., XI.1932 (P) ; *Petit-Thouars* s.n., s.loc. (P) ; *Portères* s.n., km 15 route Tananarive-Tamatave, 13.IV.1953 (P) ; *Scott-Elliott* 1801, Antananarivo, 1890 (K) ; *Waterlot* 278, Nosy Be (P).

11. *Lindernia viguieri* (Bonati) E. Fischer, comb. nov. — Fig. 4, 12.

- *Ilysanthes viguieri* BONATI, Bull. Soc. Bot. Genève, Sér. II, 18 : 3 (1926).
- *Ilysanthes pseudoviguieri* BONATI, Bull. Soc. Bot. Genève, Sér. II, 18 : 4 (1926), syn. nov. Type : *Viguier & Humbert* 378, env. de Tamatave, bords de la lagune d'Ampanalana, 26.IX.1912 (holo-, P ; iso-, K).

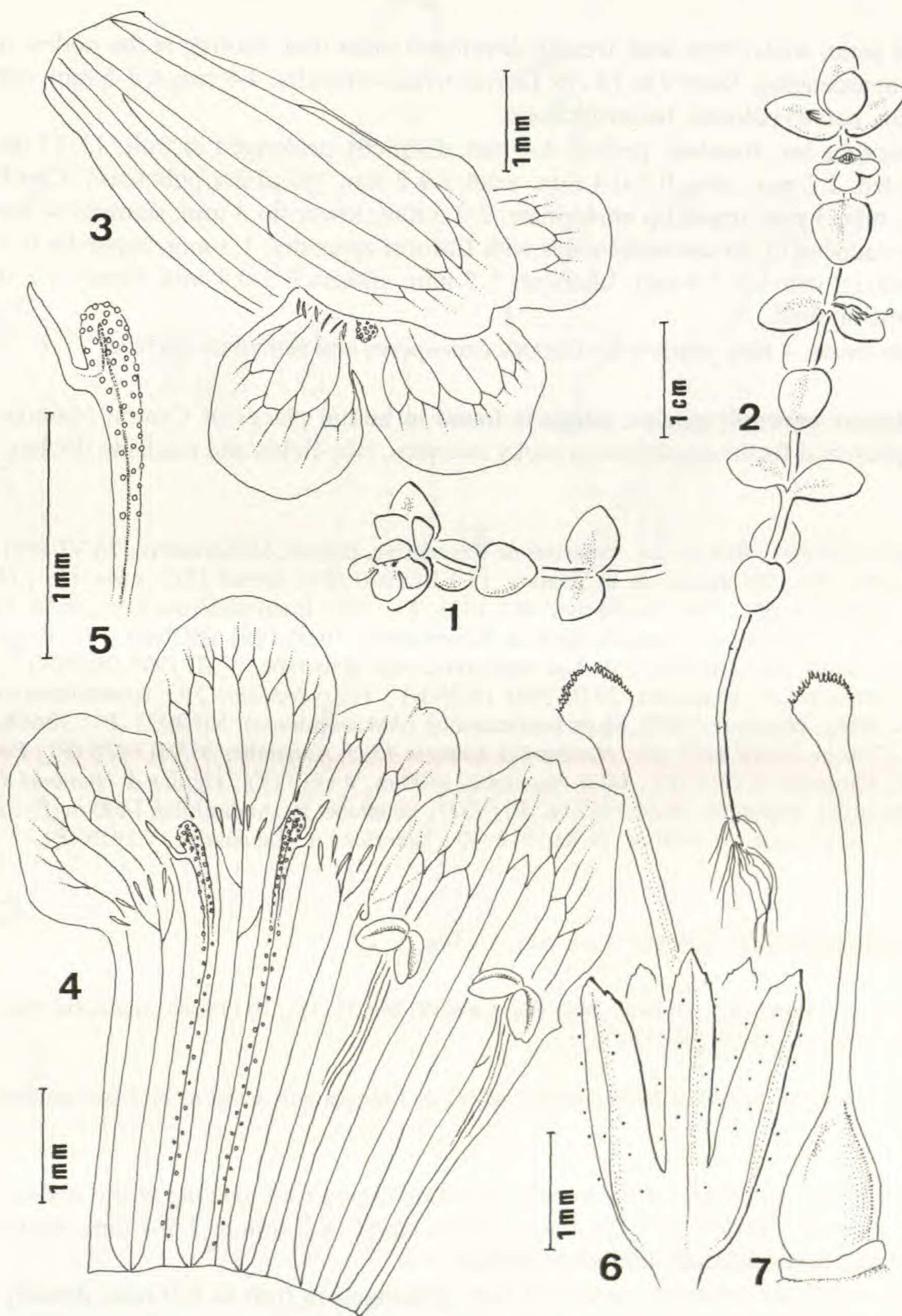


Fig. 4. — **Lindernia viguieri** (Bonati) E. Fischer : 1, 2, habit ; 3, corolla ; 4, corolla dissected ; 5, staminode ; 6, calyx ; 7, pistil. All from Fischer 173.

TYPE : *Perrier de la Bâthie* 8489, Centre : Ancien bassin desséché à Antsirabe (holo-, P).

Annual plant, rootsystem with weakly developed main root, rooting at the nodes, main axis decumbent to ascending. Stem 9 to 14 cm. Leaves ovate-orbicular, 4-8 mm × 3-5 mm, obtuse with entire margin, nerves palmate, inconspicuous.

Inflorescence lax, frondate, pedicel 3-4 mm, distinctly prolonged in fruit, 13-15 mm. Calyx deeply divided, 2.2 mm, tube 0.3-0.4 mm, teeth 1.9-2 mm, glandular pubescent. Corolla white, 6 mm long, tube 3 mm, upper lip emarginate, 2-2.3 mm, lower lip 3 mm, stamens 4, the anterior abaxial pair reduced to clavate staminodes with filiform appendix, 1.3 mm, appendix 0.3 mm, the posterior adaxial pair 1.7-1.9 mm, filaments 1.5 mm, anthers 0.2-0.4 mm. Ovary 1.2 mm, style 3 mm, stigma bilobed.

Capsule ovate, 4 mm, seeds with smooth endosperm and reticulate surface.

A Malagasy endemic species, which is found in humid places of Central Madagascar, e.g. swamps, ephemeral flush vegetation on rocky outcrops, rice-fields and roadside ditches.

MATERIAL STUDIED : *Benoist s.n.*, environs de Tananarive, près de Mahazoarivo, 26.VI.1951 (P) ; *s.n.*, *ibid.*, 1.VII.1951 (P) ; 70, marais de la Sisaony, 13.VIII.1950 (P) ; *Grevé* 181, *s.loc.* (P) ; *Decary s.n.*, Ambohibe, 14.II.1917 (P) ; 564, Tananarive, 30.I.1921 (P) ; 689, Imerimandroso (P) ; 6653, Tananarive, 29.VII.1928 (P) ; *Fischer s.n.*, roadside ditch at Ranomafana, 10.III.1991 (BONN) ; 42, rice-fields near Ambatolampy, 26.III.1993 (BONN) ; 89, Lac Andraikiba near Antsirabe, 27.III.1993 (BONN) ; 173, rocky plateau at Tsarasaotra S. Ambositra, 29.III.1993 (BONN) ; *Forsyth-Major* 592, Ambohimitoro forest, 26.XII.1894 (BM) ; *Humbert* 13479, Mont Itrafanaomby (Ankazondrano), XII.1933 (P) ; 18668, bassin du Sambirano, 1700 m, 11.XII.1937 (P) ; *Humbert & Swingle* 4593, Antsirabe, 20.VII.1928 (P) ; *Perrier de la Bâthie* 8489, Antsirabe, V.1913 (P) ; 8492, Antsirabe, 1800 m, V.1913 (P) ; *Viguier & Humbert* 378, lagune près d'Ampanalana, Tamatave, 26.IX.1912 (K, P) ; 1311, Antsirabe, lac Andraikiba, 1400 m (P) ; 1749, entre Ambatolampy et Tsinjoarivo, 1600 m, 29.XI.1912 (P) ; *Waterlot s.n.*, Tananarive, V.1915 (P).

12. *Lindernia bonatii* E. Fischer, nom. nov. — Fig. 5, 12.

— *Ilysanthes micrantha* BONATI, Bull. Soc. Bot. Genève, Sér. II, 18 : 10 (1926), non *Lindernia micrantha* D. DON, Prodr. Fl. Nepal : 85 (1825).

TYPE : *Perrier de la Bâthie* 8486, Ouest : sables de l'Ikopa, aux environs de Maevatanana, VII.1900 (holo-, P).

Annual plant, rootsystem with weakly developed main root, rooting at the nodes, main axis ascending to erect. Stem 5 to 8 cm long. Leaves ovate, 5-7 mm × 2.5-4 mm, acuminate with entire margin, nerves palmate, midnerve distinct.

Inflorescence lax, frondate, pedicel 5 mm, prolonged in fruit to 8-9 mm, densely glandular pubescent. Calyx deeply divided, 2 mm, tube 0.3 mm, teeth 1.7 mm, densely glandular pubescent. Corolla white with large blue or violet spots, 5.8 mm, tube 3 mm, upper lip bifid, 2.3 mm, lower lip 2.7 mm, stamens 4, the anterior abaxial pair reduced to clavate staminodes with filiform appen-

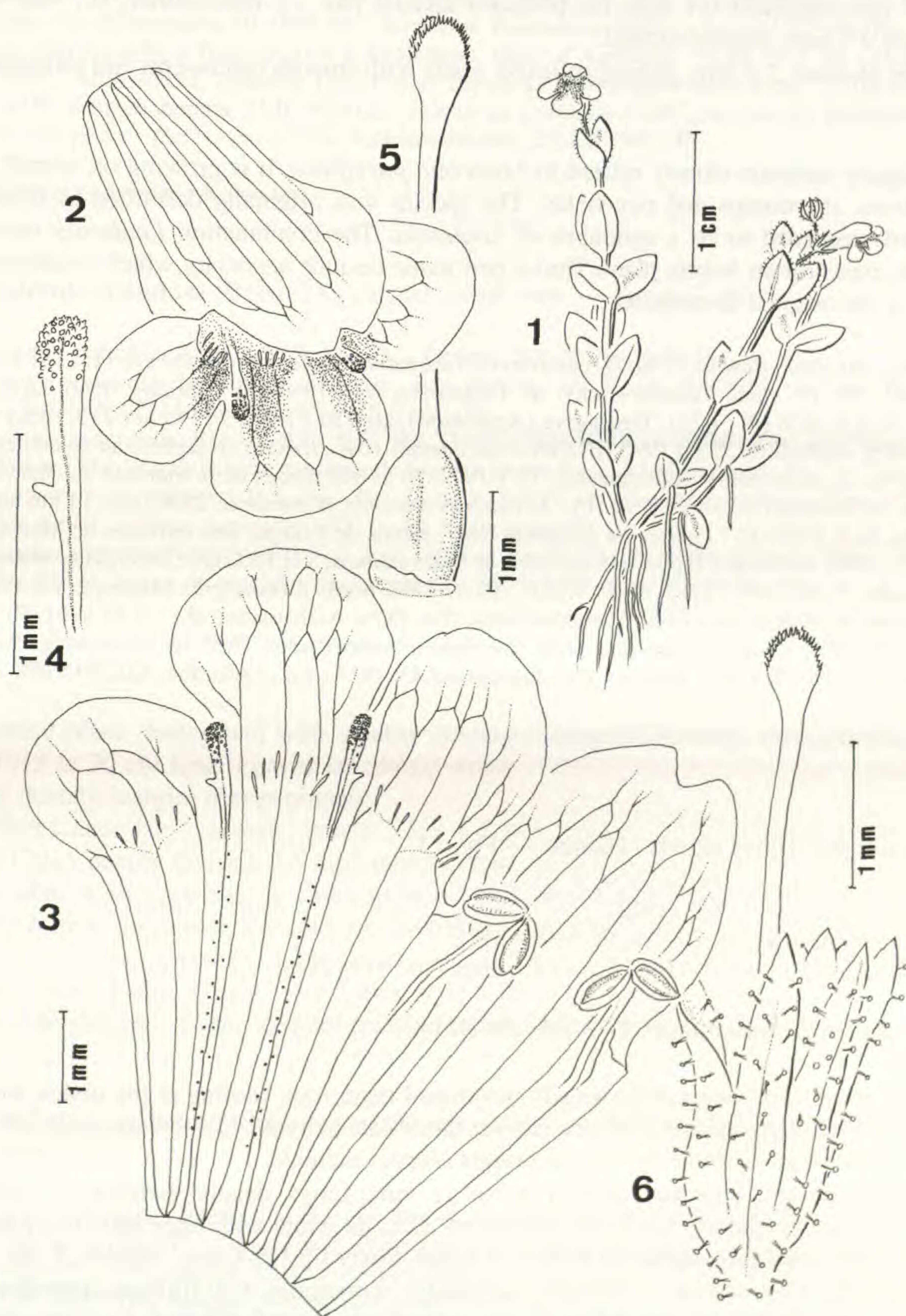


Fig. 5.—**Lindernia bonatii** E. Fischer : 1, habit ; 2, corolla ; 3, corolla dissected ; 4, staminode ; 5, pistil ; 6, calyx. All from Fischer 175.

dix, 1.2-1.3 mm, appendix 0.1 mm, the posterior adaxial pair 1.5 mm, anthers 0.7 mm. Ovary 1.4 mm, style 2.7 mm, stigma bilobed.

Capsule globose, 2-3 mm, pedicel reflexed, seeds with smooth endosperm and reticulate surface.

A Malagasy endemic closely related to *Lindernia parviflora*. It is growing on humid, sandy soil near rivers, in swamps and rice-fields. The species was originally described as *Ilysianthes*, which is now regarded to be a synonym of *Lindernia*. The combination *Lindernia micrantha* however yet exists for an Asiatic plant. Thus a new name became necessary which commemorates the author of the original description.

MATERIAL STUDIED : *Benoist 1750-51*, environs de Tananarive, route d'Antsirabe km 11, 13.II.1951 (P) ; *Bosser 18482*, PK 19, route Tamatave, env. de Tananarive, VIII.1963 (P) ; *Decary 6666*, environs de Tananarive, 29.VII.1928 (P) ; 6735, Tananarive (Ambohipo), 26.VIII.1928 (P) ; *Fischer 175*, rocky plateau at Tsarasaotra S. Ambositra, 29.III.1993 (BONN) ; *Jacquemin 1046*, rizières en jachère au sud du carrefour de la RN 7 (PK 22) et la route d'Andramasina, 31.V.1972 (P) ; 1069, fossés de la tranchée du chemin de fer à Ifarihy, sud de Tananarive, 27.VI.1972 (P) ; *Keraudren-Aymonin & Aymonin 25092 bis*, 14 km au sud de Fianarantsoa, 22.X.1970 (P) ; *Perrier de la Bâthie 8481*, sables de l'Ikopa, aux environs de Maevatanana, VII.1900 (P) ; 8486, sables de l'Ikopa, aux environs de Maevatanana, VII.1900 (P) ; 8489, Maevatanana (P) ; 8490, Antsirabe, V.1913 (P) ; 8491, *ibid.*, V.1913 (P) ; 17308, bords d'étang près Majunga, VII.1925 (P) ; *Réerves Naturelles Rakotovao 11840*, Manakambahiny Est, Distr. Ambatondrazaka, 12.IV.1961 (P) ; 11878, *ibid.*, 12.V.1961 (P) ; *Viguier & Humbert 1166*, Province d'Andovoranto, Distr. de Moramanga, sables au bord du Mangoro, IX.1912 (P) ; *Waterlot s.n.*, Tananarive, IX.1915 ; *s.n.*, Antsirabe, XII.1915 (P).

VERNACULAR NAMES : Ahipody, Tsingolo.

13. *Lindernia parviflora* (Roxb.) Haines. — Fig. 13.

Bot. Bihar & Orissa 4 : 635 (1922).

- *Gratiola parviflora* ROXB., Corom. Pl. 3 : 3 (1819).
- *Ilysianthes parviflora* (ROXB.) BENTH., in DC., Prodr. 10 : 419 (1846).

TYPE : *Roxburgh*, India, Corom. Pl. 3, tab. 203 (1819).

Annual plant, root system with weakly developed main root, rooting at the nodes, main axis ascending to erect. Stem up to 10(20) cm. Leaves lanceolate to ovate, (2)7-30 mm × (0.5)5-10 mm, acuminate with entire or minutely crenate margin, nerves palmate.

Inflorescence lax, frondate, pedicel up to 11 mm. Calyx deeply divided, 2-3 mm, tube 0.2 mm, glabrous or sparsely glandular pubescent. Corolla white with large blue or violet spots, (3)6-8 mm, tube 1.8-4 mm, upper lip bifid, 1.2-3 mm, lower lip 1.5-4 mm, stamens 4, the anterior abaxial pair reduced to clavate or filiform staminodes, sometimes with filiform appendix, 2 mm, the posterior adaxial pair 1.5 mm. Ovary 1 mm, style 4 mm, stigma bilobed.

Capsule globose, 2-3 × 2-3 mm, pedicel reflexed, seeds with smooth endosperm and reticulate surface.

MATERIAL STUDIED : *Baron* 273, s.loc. (P) ; *Decary* 8204, environs de Tambohorano, 20.VI.1930 (P) ; *Grandidier* s.n., Morondava, III.1869 (P) ; *Jard. Bot. Tananarive* 3688, s.loc., 8.VI.1938 (P) ; *Humbert & Capuron* 25918, vallée d'Ifasy en aval d'Anaborano, Distr. d'Ambilobe, 31.III.1951 (P) ; *Mabberley* 751, Tuléar Prov., Morondava, Ankirisa Forest near Beroboka, Morondava-Belo-Road, 20.III.1971 (K, P) ; *Peltier* 4780, Ampamaherana, 21.II.1964 (P) ; *Perrier de la Bâthie* 17445, environs de Tamatave, 1925 (P) ; Réserves Naturelles : *Rakotovao* 12356, Ambatondrazaka, 21.XII.1962 (P).

VERNACULAR NAME : Kolobanta.

14. ***Lindernia paludosa* (Bonati) E. Fischer, comb. nov.** — Fig. 6, 7, 13.

- *Ilysanthes paludosa* BONATI, Bull. Soc. Bot. Genève, Sér. II, 18 : 5 (1926).
- *Ilysanthes macrophylla* BONATI, Bull. Soc. Bot. Genève, Sér. II, 18 : 8 (1926), syn. nov. Type : *Perrier de la Bâthie* 8497, Menarandra, VI.1910 (holo-, P).
- *Ilysanthes macrantha* BONATI, Bull. Soc. Bot. Genève, Sér. II, 18 : 6 (1926), syn. nov. Type : *Perrier de la Bâthie* 1554, marais salants environs de Soalala (Ambongo), VI.1903 (holo-, P).
- *Ilysanthes perrieri* BONATI, Bull. Soc. Bot. Genève, Sér. II, 18 : 11 (1926), syn. nov. Type : *Perrier de la Bâthie* 12684, rizières, Aorombe, 1000 m, VI.1919 (holo-, P).
- *Ilysanthes longipes* BONATI, Bull. Soc. Bot. Genève, Sér. II, 18 : 7 (1926), syn. nov. Type : *Perrier de la Bâthie* 14324, autour du massif d'Andringitra, de 800 à 1400 m, I.1922 (holo-, P).

TYPE : *Perrier de la Bâthie* 8495, marais et rizières sur gneiss, 700 m, Zazafotsy, bassin de la Mananara, IX.1911 (holo-, P).

Annual plant, root system with weakly developed main root, main axis ascending to erect. Stem (6)12 to 30 cm long. Leaves lanceolate-ovate, (7)10-25 mm × (2)4-8 mm, acuminate with sparsely dentate margin, nerves pinnate.

Inflorescence lax, bracteate, bracts 2-5 × 1-2 mm, pedicel 20-30 mm, prolonged in fruit to 40 mm. Calyx deeply divided, 3.5 mm, tube 0.5 mm, teeth 3 mm, glabrous to sparsely pubescent. Corolla white with large blue or violet spots, 12 mm long, tube 6.5 mm, upper lip bifid, 4-5 mm, lower lip 6 mm, stamens 4, the anterior abaxial pair reduced to clavate staminodes with filiform appendix, 2.5 mm, appendix 0.3-0.4 mm, the posterior adaxial pair 2.5 mm, filaments short, 1.5 mm, anthers 1 mm. Ovary 1.4-1.5 mm, style 5.2-5.5 mm, stigma bilobed.

Capsule globose, 4 mm, pedicel reflexed, seeds with smooth endosperm and reticulate surface.

A Malagasy endemic, which occurs mainly in Southwestern Madagascar in open places on sandy, humid soil.

MATERIAL STUDIED : *Bosser* 10093, entre Beloha et Ampotaka, XI.1956 (P) ; 14232, bord de mare temporaire, Beloha, V.1960 (P) ; *Croat* 31637, Prov. Tuléar, vicinity of Tsihombe, 18.II.1975 (P) ; *Decary* 2701, Ambovombe (P) ; 3066, Behara, Distr. d'Ambovombe, 29.VIII.1924 (P) ; 4186, Antanimora, Fort Dauphin, 11.VII.1926 (P) ; 4316, Behara, près de Fort Dauphin, 9.VII.1926 (P) ; 4632, Antanimora, Fort Dauphin, 24.VII.1926 (P) ; 8914, vallée de l'Ikonda, au N. d'Ambovombe, 1931 (P) ; 10301, Vinanibe, Distr. de Fort Dauphin, trous humides sur les rochers de gneiss, 14.VIII.1932 (P) ; *Fischer* 480, Lac Mantasoa ca. 3 km S. Ambatolaona, 17.IV.1993 (BONN) ; *Humbert* 7075, vallée de l'Onilahy, Mangoky, 20.XII.1928 (P) ; 12793,

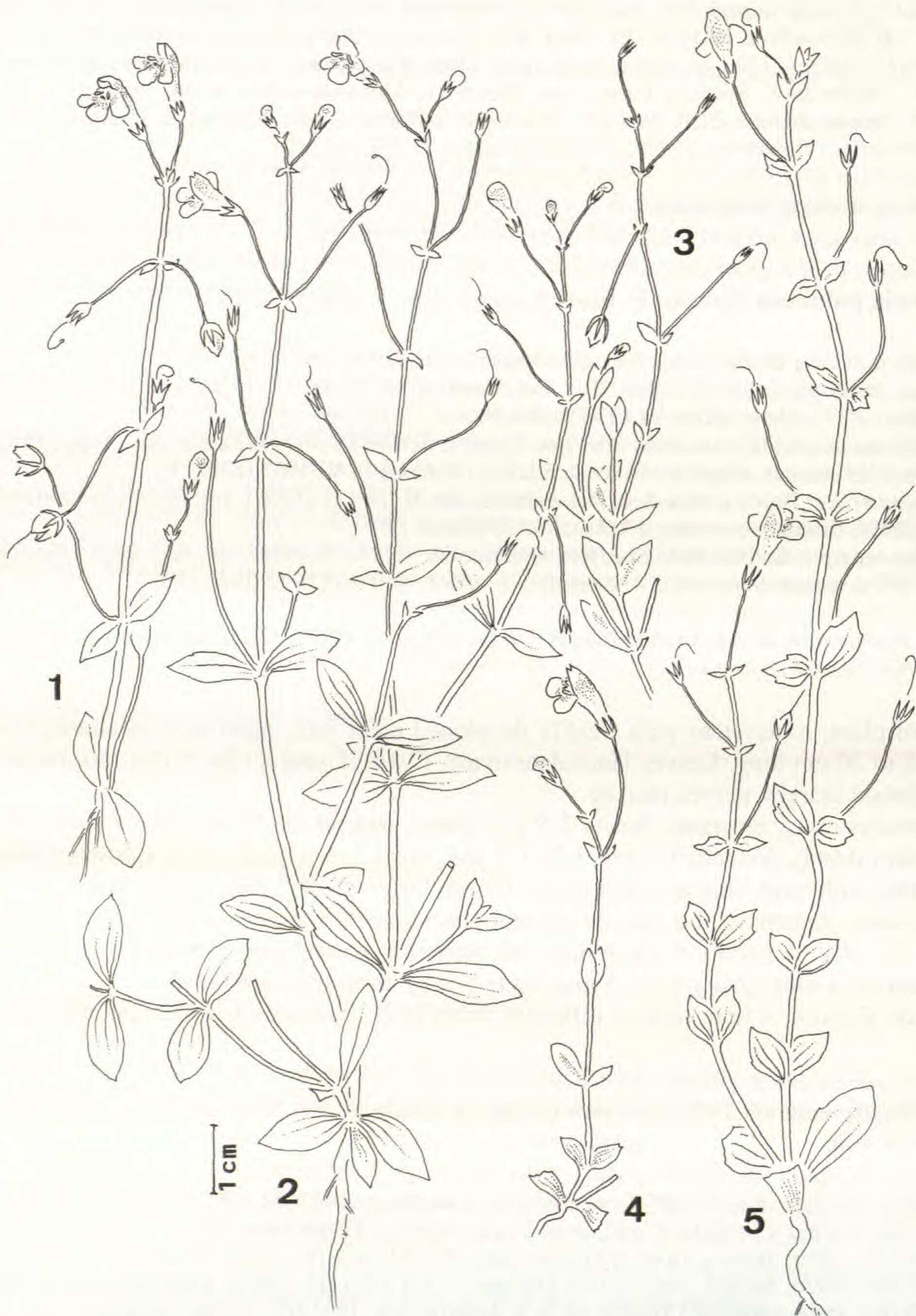


Fig. 6. — **Lindernia paludosa** (Bonati) E. Fischer : 1-5, habit. 1, from Decary 3066, 2, from Perrier de la Bathie 8497, 3-4 from Phillipson 2317, 5, from Perrier de la Bathie 14324.

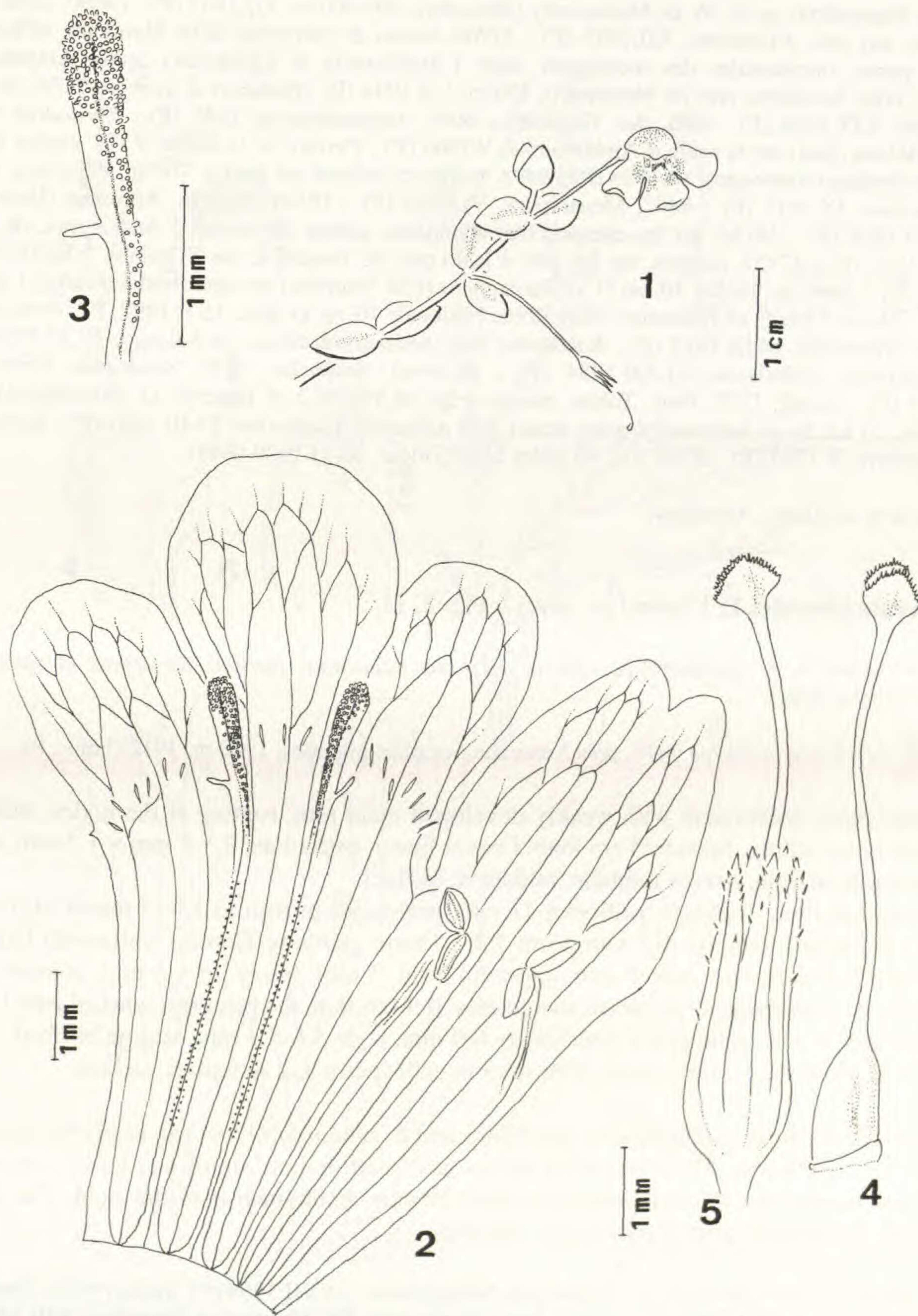


Fig. 7.—*Lindernia paludosa* (Bonati) E. Fischer : 1, habit ; 2, corolla dissected ; 3, staminode ; 4, pistil ; 5, calyx. All from Fischer 480.

vallée de la Manambolo, au N.-W. de Maroaoomby (Betsioky), 300-400 m, XII.1933 (P) ; 13000, vallée de la Manambolo, aux env. d'Isomono, XII.1933 (P) ; 13760, bassin de réception de la Mandrara, affluent de Mandrare, pentes occidentales des montagnes entre l'Andohahela et l'Elakelaka, entre Ampahiso et Mahamavo, talus de rizières près de Mahamavo, 450 m, 1.II.1934 (P) ; Humbert & Swingle 5584, environs de Tsihombe, 8.IX.1928 (P) ; Jard. Bot. Tananarive 6069, Ampandranava, 1943 (P) ; Keraudren 943, à 10 km de Beloha (Sud) sur la route d'Ambovombe, V.1960 (P) ; Perrier de la Bâthie 1554, marais salants environs de Soalala (Ambongo), VI.1903 (P) ; 8495, marais et rizières sur gneiss, 700 m, Zazafotsy, bassin de la Mananara, IX.1911 (P) ; 8497, Menarandra. VI.1910 (P) ; 12684, rizières, Aorombe (Horombe), 1000 m, VI.1919 (P) ; 14324, sur les chemins très abondants, autour du massif d'Andringitra, de 800 à 1400 m, I.1922 (P) ; 17355, rizières, sur les grès d'Isalo près de Fanjahira, sur l'Onilahy, VIII.1925 (P) ; Phillipson 2317, Prov. de Tuléar, 10 km N. of Taolagnaro (Fort Dauphin) on road to Mahatalaky, 1.X.1987 (P) ; 3507, Toliara, 3 km E. of Tsihombe, along Route Nationale 10, rocky area, 16.II.1990 (P) ; Poisson 552, plateau de l'Horombe, 14.IX.1912 (P) ; Rakotovao 649, Andranomiadilola, Ambalavao, 20.XI.1954 (P) ; 692, Antanifotsy, Ambalavao, 11.XII.1954 (P) ; Réserves Naturelles 7337, Sendrisoa, Ambalavao, 28.III.1955 (P) ; Schatz 1272, Prov. Tuléar, eastern edge of Parcel 2 of Réserve 11 (Andohahela) near Ambatombo, 51 km N. of Amboasary, spiny desert with *Alluaudia-Euphorbia*, 18.III.1987 (P) ; Seyrig 183, Ampandrandava, X.1942 (P) ; White s.n., 60 miles N. of Tuléar, 20.VI.1929 (BM).

VERNACULAR NAME : Aferotany.

15. *Lindernia bryoides* E. Fischer, sp. nov. — Fig. 8, 11.

L. parviflorae et L. rotundifoliae affinis, sed foliis minoribus, floribus majoribus et staminodiis falcato-incurvatis differt.

TYPE : *Perrier de la Bâthie* 4449, près Antsirabe, rocallles humides, 1550 m, 1912 (holo-, P).

Annual plant, root system with weakly developed main root, rooting at the nodes, main axis decumbent to ascending. Stem to 5 cm long. Leaves linear-lanceolate, 2.5-3 mm × 1.3 mm, acuminate with entire margin, nerves palmate, midnerve distinct.

Inflorescence lax, frondate, pedicel 6-11 mm, prolonged in fruit to 15-17 mm. Calyx deeply divided, 1.5-1.6 mm, tube 0.1-0.3 mm, teeth 1.3-1.4 mm, glabrous. Corolla white with large blue or violet spots, 7 mm long, tube 3 mm, upper lip bifid, 3 mm, lower lip 4-5 mm, stamens 4, the anterior abaxial pair reduced to falcate staminodes, 0.5-0.6 mm, the posterior adaxial pair 1.3 mm, filaments short, 1 mm, anthers 0.9 mm. Ovary 0.9 mm, style 5.6-5.7 mm, stigma bilobed.

Capsule globose, 2.2 mm, seeds with smooth endosperm and reticulate surface.

Lindernia bryoides is related to *L. parviflora* and *L. rotundifolia*, but can easily be recognized by its falcate staminodes. The plant has a mossy habit with minute stems and leaves, resembling *Bryodes micrantha*, but the comparatively large flowers distinguish it in the field. The plant is growing on humid soil, mainly over rocky outcrops.

MATERIAL STUDIED : Benoit s.n., rizières près Mahazoarivo, 14.VII.1958 (P) ; Bosser 8312, Tananarive, PK 34 route du Sud, VIII.1955 (P) ; 18482, bord de ruisseau, PK 19 route de Tamatave, VIII.1963 (P) ; Decary 1034, Maromandia (Bemaneviky), u.c. *Limosella australis*, 23.IX.1922 (P) ; Perrier de la Bâthie 4449, près Antsirabe, rocallles humides, 1550 m, 1912 (P).

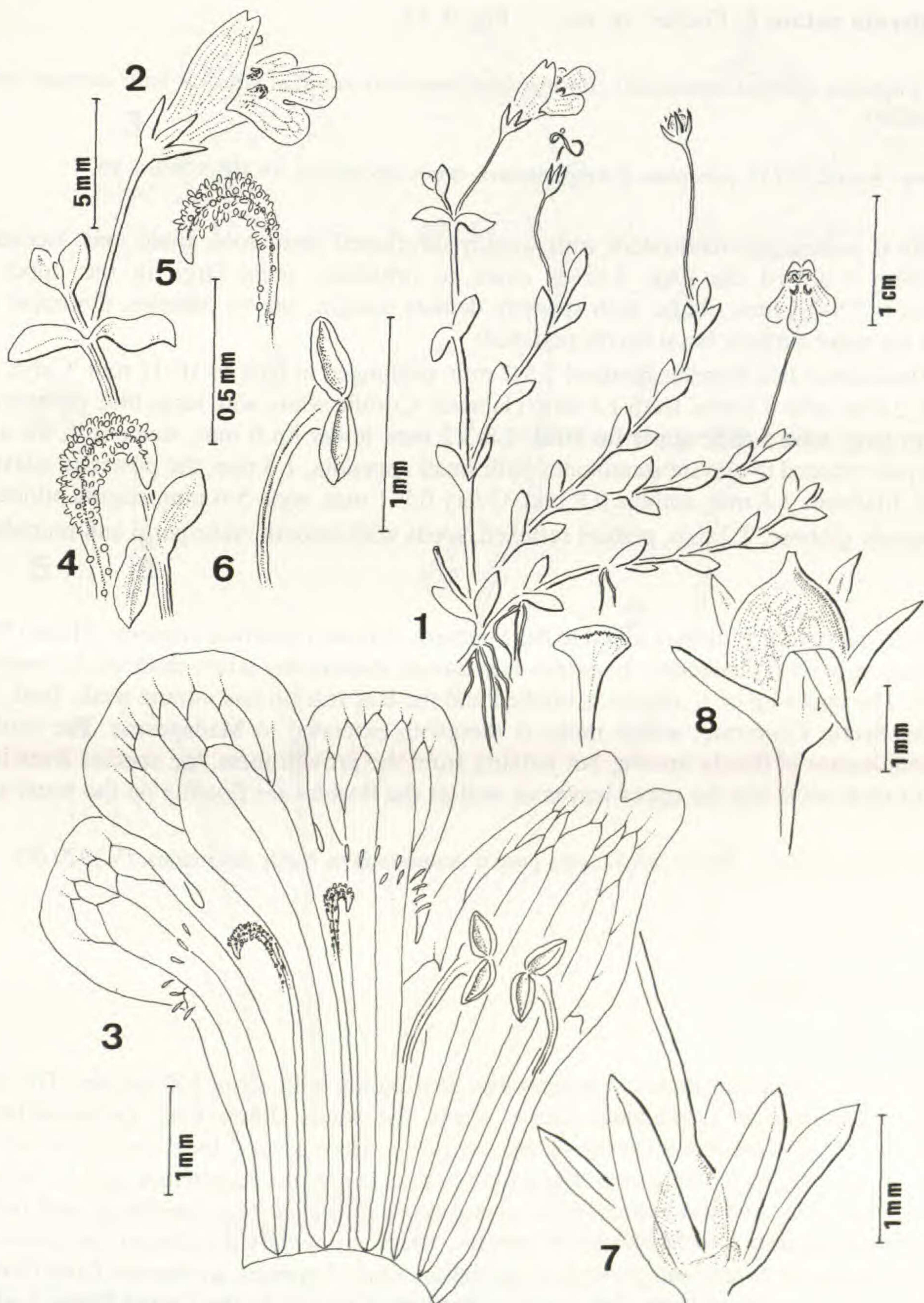


Fig. 8. — *Lindernia bryoides* E. Fischer : 1, habit ; 2, stem with flower ; 3, corolla dissected ; 4, 5, staminode ; 6, stamen ; 7, pistil with calyx ; 8, capsule. All from Perrier de la Bathie 4449.

16. *Lindernia natans* E. Fischer, sp. nov. — Fig. 9, 12.

Ab Lindernia conferta staminodiis clavatis, labio superiore corollae bifido et foliis margine subtiliter dentato differt.

TYPE : *Bosser 20157*, près piste d'Ampasindava, bords des marais, IV.1970 (holo-, P).

Annual waterplant, rootsystem with weakly developed main root, main axis ascending to erect. Stem 8 to 10 cm long. Leaves ovate to orbicular, most large in the upper third, 5-10 mm × 3.5-4.5 mm, obtuse with sparsely dentate margin, nerves palmate, the upper leaves floating on water surface, basal leaves perished.

Inflorescence lax, frondate, pedicel 2.5-7 mm, prolonged in fruit to 10-11 mm. Calyx deeply divided, 2 mm, tube 0.5 mm, teeth 1.5 mm, glabrous. Corolla white with large blue or violet spots, 10.5 mm long, tube 5 mm, upper lip bifid, 2.8-3.2 mm, lower lip 6 mm, stamens 4, the anterior abaxial pair reduced to clavate staminodes with small appendix, 1.5 mm, the posterior adaxial pair 2.2 mm, filaments 1.8 mm, anthers 0.8 mm. Ovary 0.9-1 mm, style 5-6 mm, stigma bilobed.

Capsule globose, 2.2 mm, pedicel reflexed, seeds with smooth endosperm and reticulate surface.

Lindernia natans is closely allied to the Southern African *Lindernia conferta* (Hiern) Philcox, but differs in several characters. *L. natans* has clavate staminodes while those of *L. conferta* are filiform. The upper lip of *L. natans* is bilobed and the leaf margin has minute teeth. Both species form the Sectio *Confertae*, whose range is therewith extended to Madagascar. The ecology of *Lindernia natans* is poorly known, but judging from the growth form, the species lives in small ponds or rock pools and the upper leaves as well as the flowers are floating on the water surface.

MATERIAL STUDIED : *Bosser 20157*, près piste d'Ampasindava, bords des marais, IV.1970 (P).

PHYTOGEOGRAPHY

The genus *Lindernia* shows a cosmopolitic distribution with about 100 species. The center of diversity is situated in Continental Africa, where the genus shows both species-richness (40 species) and a considerable diversity of growth forms. Here several local endemics with a high ecological specialisation occur (e.g. the poikilohydric *Lindernia yaundensis* and *L. linearifolia*) probably due to an adaptive radiation in several types of habitat (e.g. inselbergs and rocky outcrops). South Eastern Asia has about 40 species, which are widely distributed and show a lesser diversity of growth forms and ecological speciation. Only 5 species are known from Central and Southern America, two of them also found in Northern America. In the United States 3 additional species do occur, two of them highly specialized (*L. saxicola* M.A. Curtis on rocks in rapid mountain streams, *L. monticola* Muhl. ex Nutt. on rock outcrops).

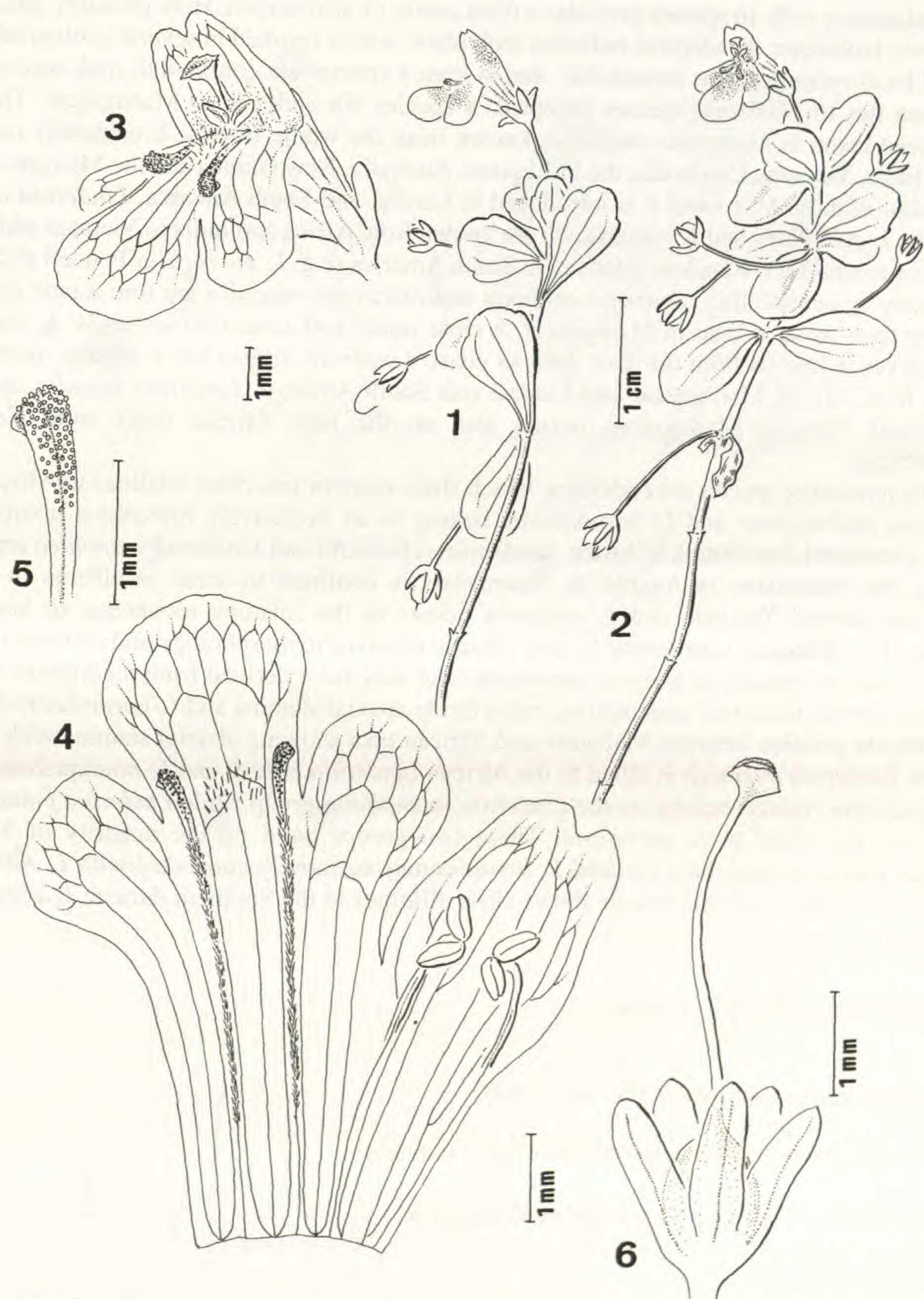


Fig. 9.—**Lindernia natans** E. Fischer : 1, 2, habit ; 3, flower ; 4, corolla dissected ; 5, staminode ; 6, pistil with calyx.
All from Bosser 20157.

Madagascar with 16 species provides a third center of distribution. Here probably induced by the diverse landscape, an adaptive radiation took place, which resulted in several ecologically specialized local endemics. It is remarkable, that at least 4 species are confined to rock outcrops.

From the 16 *Lindernia* species accepted, 8 species are endemic to Madagascar. The most widespread taxon is *Lindernia crustacea*, known from the whole tropics. It originally occurs in Africa, India, Vietnam, Cambodia, the Phillipines, Australia, New Guinea and the Micronesian and Polynesian islands. As a weed it is introduced to Central and South America. *Lindernia nummulariifolia*, *L. parviflora* and *L. rotundifolia* are known from Africa and India to Vietnam and China. *Lindernia rotundifolia* has close relatives in South America (e.g. *L. microcalyx* Pennell ex Stehlé), which may be conspecific. *Lindernia antipoda* and *Lindernia anagallis* are true asiatic elements, reaching their western limit in Madagascar. A close relative of *Lindernia antipoda*, *L. zanzibarica*, however is known from the East African coast. *Lindernia diffusa* has a strange distribution, known from Africa, Madagascar and Central and South America. *Lindernia humilis*, described from South Western Madagascar, occurs also on the East African coast from Kenya to Mocambique.

The remaining species are endemics, which show more or less close relations to African taxa. *Lindernia andringitiae* and *L. horombensis* belong to an exclusively rupicolous group, which shows a scattered distribution in Africa. *Lindernia welwitschii* and *Lindernia scapoidea* are known from a few mountains in Angola, *L. yaundensis* is confined to some inselbergs in Central Cameroon around Yaoundé and *L. sudanica* occurs in the Imatong mountains in Sudan and Uganda. The Malagasy taxa resemble their African relatives in morphology and ecology (they are also confined to granitic or gneissic inselbergs) and may have derived from a common ancestor. As stated above, *Lindernia andringitiae* bears fertile abaxial stamina and *L. horombensis* holds an intermediate position between Malagasy and African taxa showing abaxial stamina with reduced anthers. *Lindernia pygmaea* is allied to the African *Lindernia bolusii* and *L. boutiqueana*.

Lindernia viguieri belongs to the *Lindernia rotundifolia* group while *Lindernia paludosa* and *L. bonatii* are allied to *L. parviflora*. These two groups build up the majority of Malagasy endemic *Lindernia* and the ± isolated *L. bryoides* may be loosely connected with *L. rotundifolia* too. The endemic *Lindernia natans* shows close affinities to the Southern African *L. conferta*.

CREPIDORHOPALON E. Fischer

Feddes Repertorium 100 (9-10) : 443 (1989).

TYPE : *Crepidorhopalon schweinfurthii* (Engl.) E. Fischer.

25 species in Africa, one species in Madagascar.

1. **Crepidorhopalon microcarpaeoides** (Bonati) E. Fischer, *comb. nov.* — Fig. 10, 12.

— *Lindernia microcarpaeoides* BONATI, Bull. Soc. Bot. Genève, Sér. II, 15 : 101 (1924).

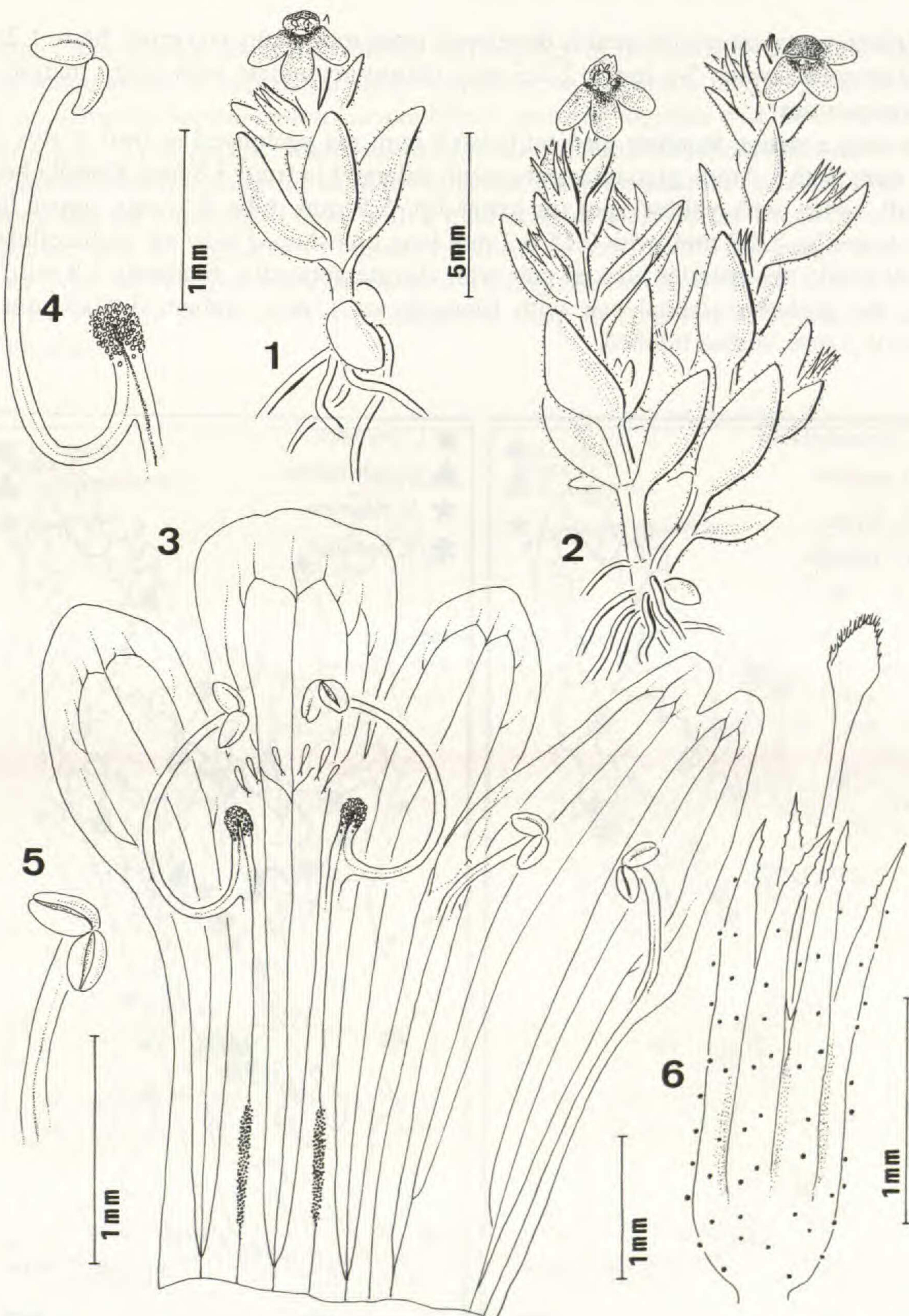


Fig. 10. — **Crepidorhopalon microcarpaeoides** (Bonati) E. Fischer : 1, 2, habit ; 3, corolla dissected ; 4, abaxial stamen ; 5, adaxial stamen ; 6, pistil with calyx. All from Fischer 337.

TYPE : *Perrier de la Bâthie s.n.*, s.loc. (holo-, P).

Annual plant, rootsystem with weakly developed main root, main axis erect. Stem 1.2 to 2 cm tall. Leaves lanceolate-ovate, 5-6 mm × 2-2.5 mm, obtuse acuminate with entire margin, nerves palmate, inconspicuous.

Inflorescence ± dense, frondate, pedicel 0.1-0.2 mm, not prolonged in fruit. Calyx 2.2 mm long, tube 1 mm, teeth 1.2 mm, glandular pubescent, enlarged in fruit, 3.8 mm. Corolla brownish-purple to dull violet, with yellow spot on lower lip, 5.5 mm, tube 2.5 mm, upper lip bifid, 2.3-2.5 mm, lower lip 2.8-3 mm, with 0.15-0.2 mm long clubshaped hairs on multicellular socle, stamens 4, all fertile, the anterior abaxial pair with clavate appendix, filaments 1.8 mm, anthers 0.3-0.4 mm, the posterior adaxial pair with filaments of 1 mm, anthers 0.4-0.5 mm. Ovary 0.9-1 mm, style 3 mm, stigma bilobed.

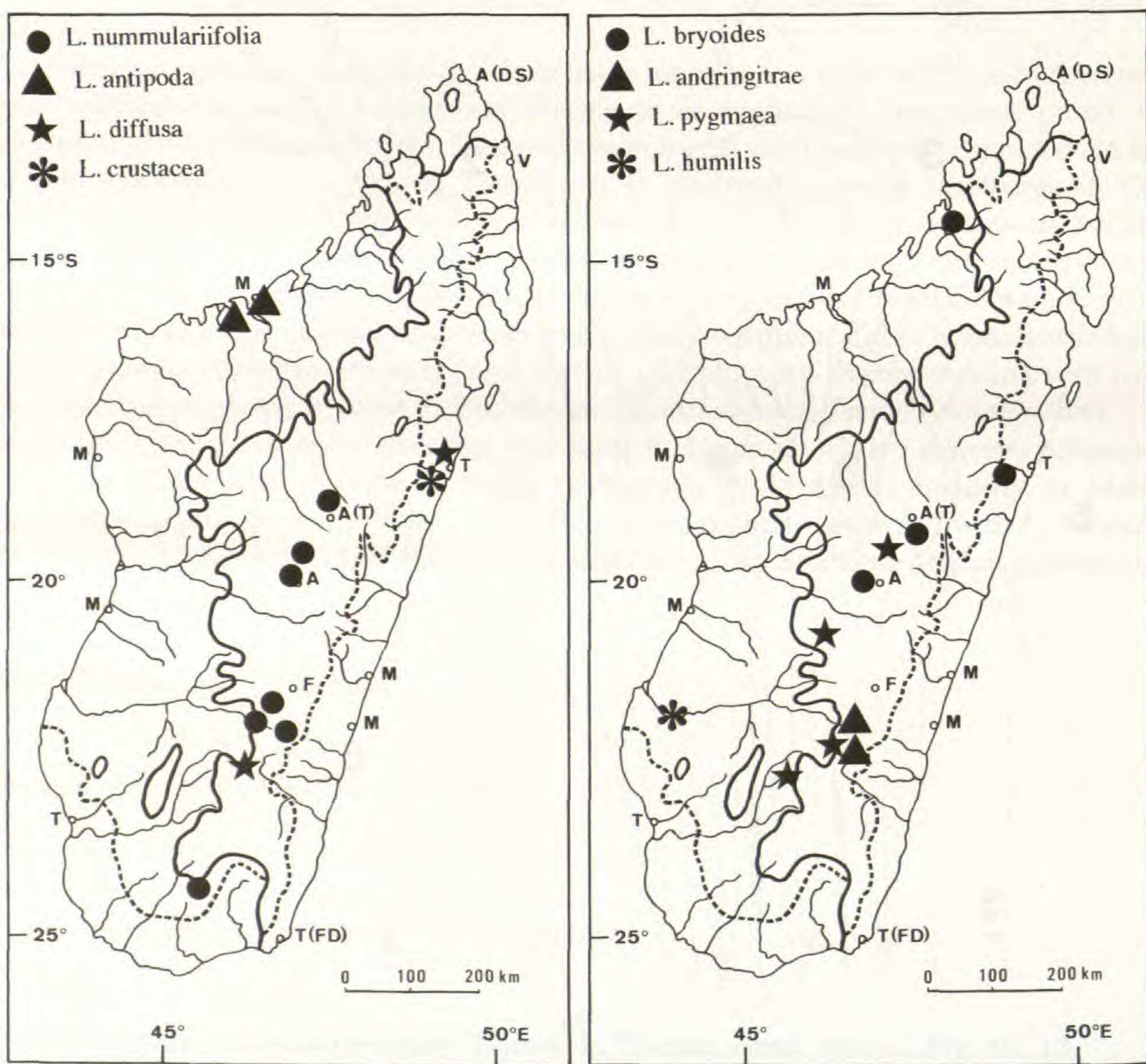


Fig. 11. — Distribution of **Lindernia** in Madagascar.

Capsule broad cylindric, 3.5 mm, seeds aulacospermous.

Nothing was known about distribution and ecology of this endemic species, when I discovered large populations in ephemeral flush vegetation on a granitic inselberg ca. 25 km S.-W. of Ambalavao. *Crepidorhopalon microcarpaeoides* is growing together with *Drosera indica*, several *Utricularia* spp., *Xyris anceps*, *Rhamphicarpa fistulosa*, *Sopubia stricta* and others. Close investigation showed that it belongs to the African genus *Crepidorhopalon* because of the aulacospermous seeds and the clubshaped hairs with a multicellular socle on the lower lip of corolla. This small species may be frequent in ephemeral flush vegetation on inselbergs in the region of Ambalavao, but has certainly been overlooked. During this revision, I found two other specimens, collected by PERRIER in North-West Madagascar (Cap St André) and by HILDEBRANDT in the Central Plateau.

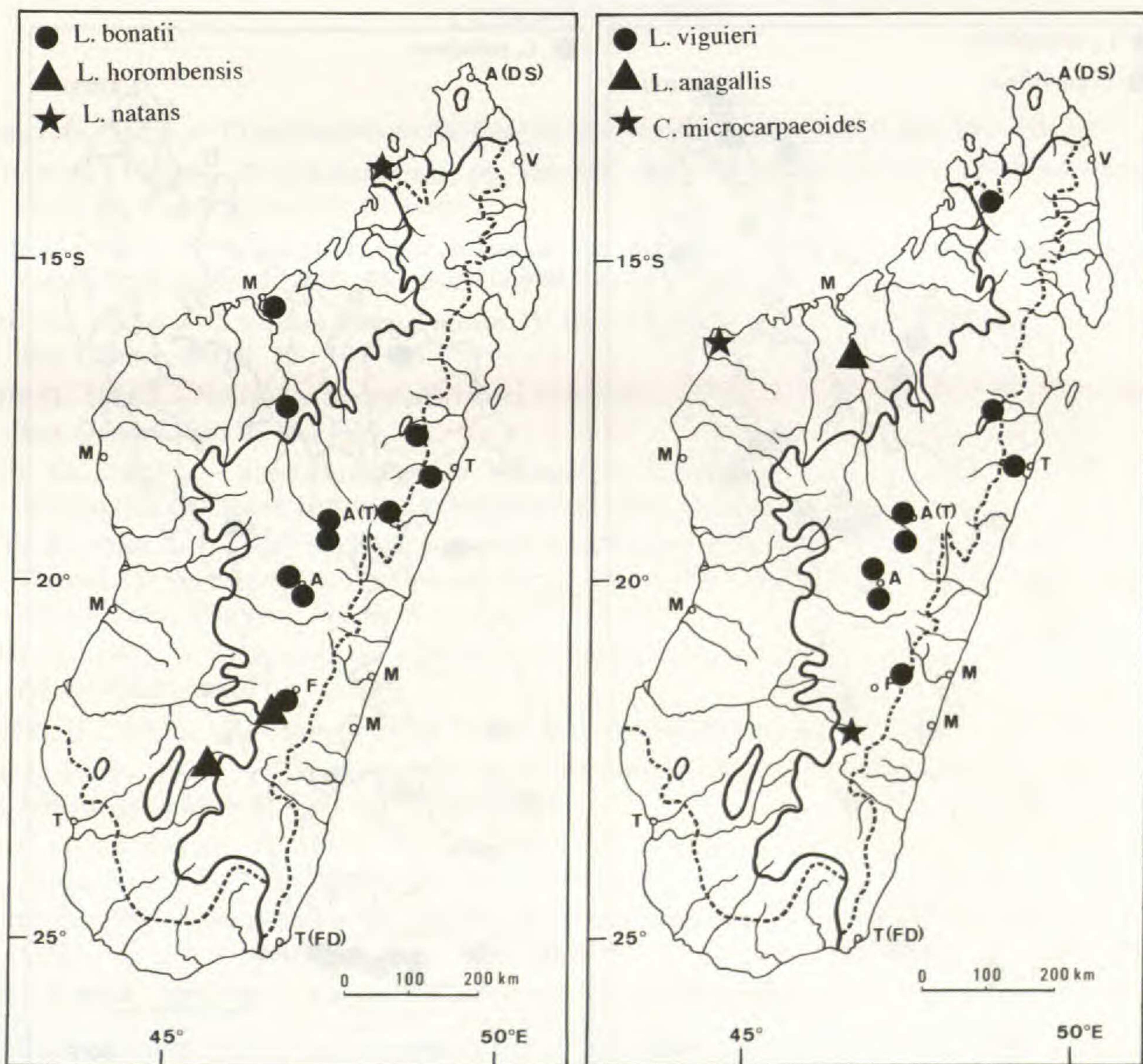


Fig. 12. — Distribution of **Lindernia** and **Crepidorhopalon** in Madagascar.

MATERIAL STUDIED : *Fischer* 337, granitic inselberg near Isaka ca. 22 km S.-W. Ambalavao near main road to Ihosy, 9.IV.1993 (BONN, P) ; *Hildebrandt* 3585, Nord-Betsileo, "Simbé", VIII.1880 (BM) ; *Perrier de la Bâthie* s.n., s.loc. (P) ; 5210, marais Cap St André, VII.1904 (P).

PHYTOGEOGRAPHY

Crepidorhopalon microcarpaeoides finds its nearest relative in continental Africa with *C. debilis* (= *Lindernia debilis* Skan), which also occurs in ephemeral flush vegetation on granitic inselbergs (S. DÖRRSTOCK & S. POREMBSKI, pers. comm.). The genus is restricted to Africa with only one species extending to Madagascar. Several members of the genus are very narrow local endemics and the same may be true for *C. microcarpaeoides*, confined to the Malagasy Highlands.

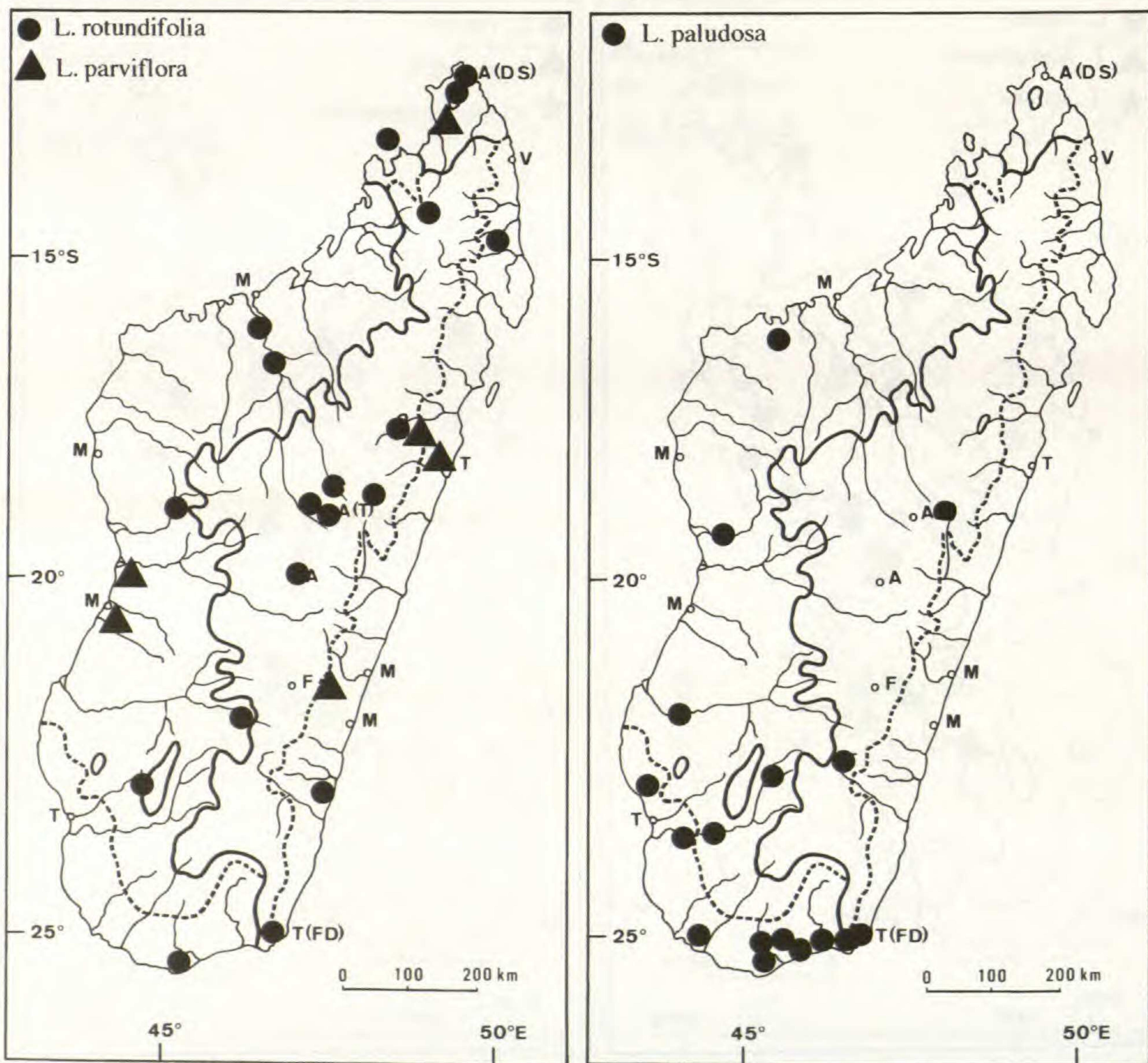


Fig. 13. — Distribution of **Lindernia** in Madagascar.

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